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WESTERN BIRDS

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WESTERN BIRDS

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WESTERN BIRDS

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SEABIRDS IN THE NORTHWESTERN PACIFIC OCEAN AND SOUTH CENTRAL BERING SEA IN JUNE 1975

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Between 6 June and 8 July 1975 I was a seabird observer on a cruise from Hakodate, Hokkaido, Japan to Kodiak, Alaska, via the south central Bering Sea, aboard the Hokkaido University Faculty of Fisheries training/research vessel, *TV Oshoro Maru*. This paper reports the distribution and relative abundance of species observed within the regions visited.

AREA COVERED

The cruise track, with noon positions, count locations and local sea surface temperatures, is shown in Figures 1a and 1b. The track was north of that sailed by Hamilton (1958) and south and east of that covered by Kuroda (1955, 1960), both of whom report on seabird distributions in June cruises in the northwestern Pacific region. Our track was west of the Bristol Bay areas censused in late summer by Bartonek and Gibson (1972) and farther offshore for the most part than the areas reported on by Murie (1959) and Trapp (1975). Transect counts were tabulated by sea areas (Figure 2), which correspond with the Domains used by Sanger (1972), as adapted from Dodimead et al. (1963). The Oyashio/Kuroshio Confluence forms the southern boundary of the Transition Domain, the Northwestern Pacific and Pelagic Bering Sea areas are within the Western Subarctic Domain, the Offshore Aleutians within the Coastal Domain, and Bering Sea Continental Shelf area within the Bering Sea Coastal Domain.

ENVIRONMENTAL CONDITIONS

Weather and observation conditions in the area were fairly typical for the season (see Kuroda 1955), although visibility was perhaps more restricted than normal (T. Fujii pers. comm.). General sea surface temperatures (Figure 2) were below long-term means in one area east of Japan

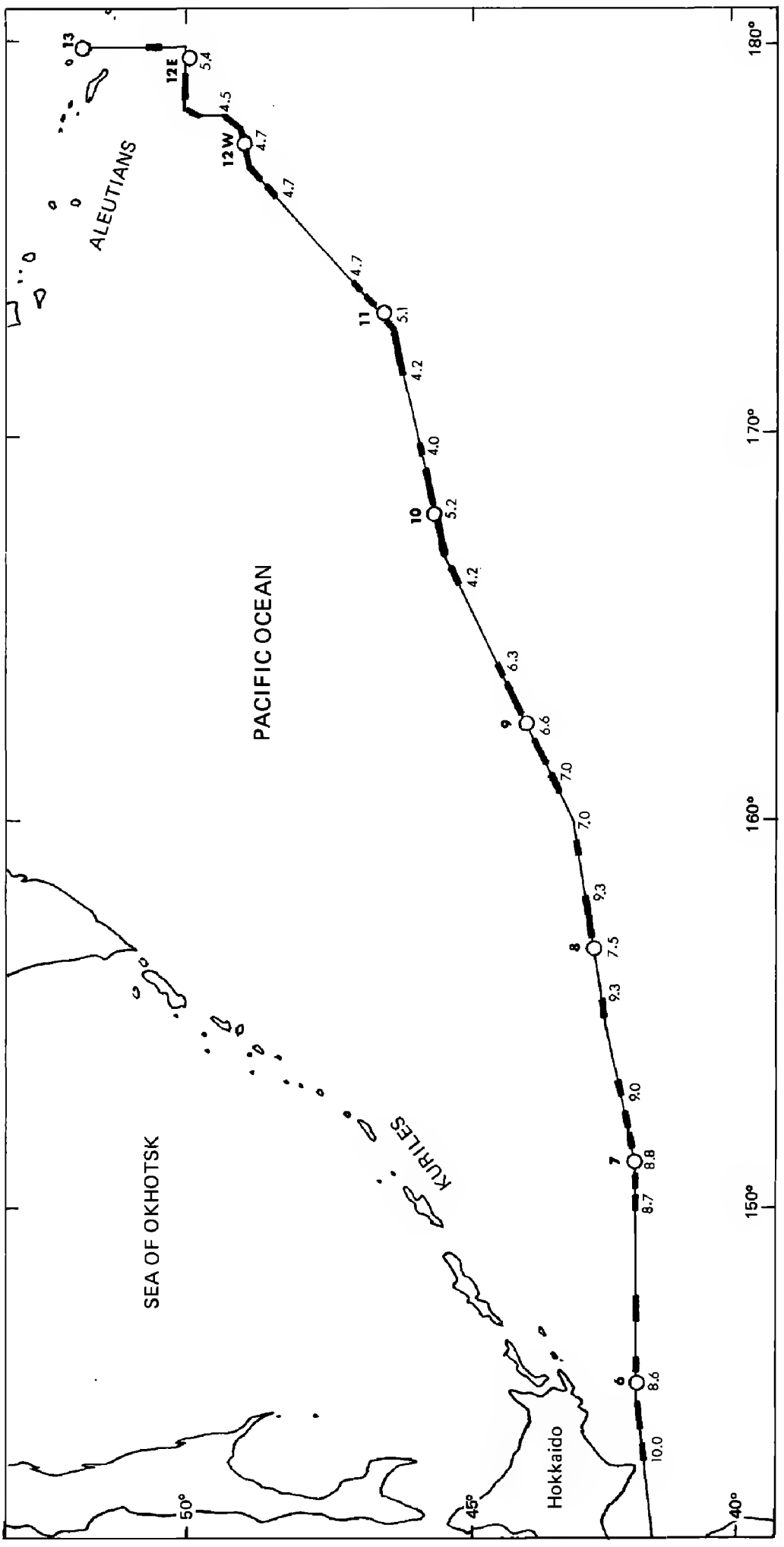


Figure 1a. Cruise track from Hokkaido to the Aleutians, locations of counts (heavy lines), noon positions 6-13 June 1975 (circles) and sea surface temperatures (°C).

and in the Aleutians and Bering Sea areas (Clark and Miller 1975, Evans and Miller 1975). Wind speeds (Figure 2) were generally moderate. Sea conditions were relatively uniform, usually with swells of 1-3 m and seas of 0-3 m. Cloud cover of 90%-100% and an effective horizon of 2000-5000 m were normal observation conditions, although periods of fog restricting visibility to 100-250 m and occasional brief sunny periods also occurred. Precipitation was infrequent and relatively light.

METHODS

Systematic observations were conducted during 112.2 hours from 6 June through 5 July while the ship was travelling a straight course at an average speed of about 11 knots. Observations were made from bridge wings approximately 6 m above the sea surface, from the side of the ship offering minimum effects of wind, precipitation, spray and (rarely) glare. Count periods usually lasted 30 to 60 minutes. Notes on all birds seen within a 300 m, 90° arc from bow to one side of the ship were tape recorded, with plumage, behavior and direction of movement noted when possible, along with conditions of observation. Flocks or unusual

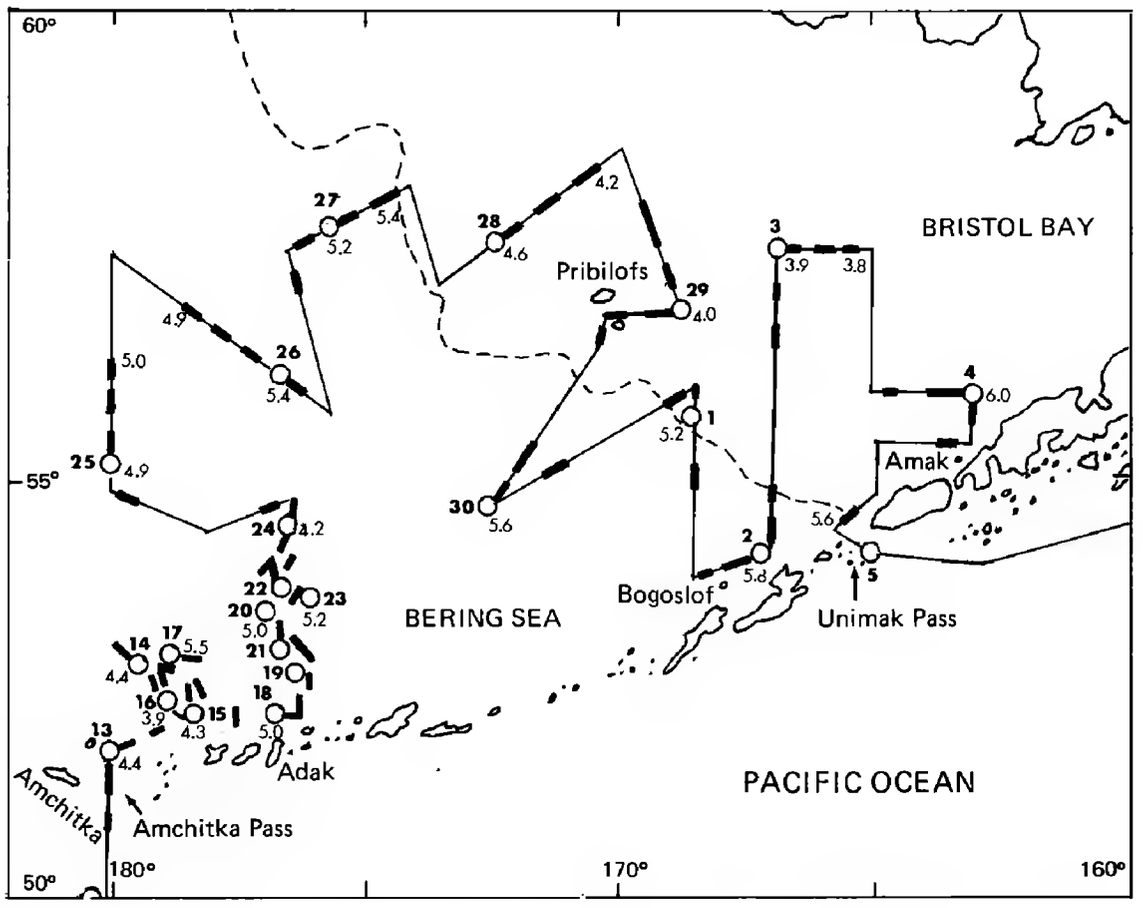


Figure 1b. Cruise track in the Bering Sea, location of counts (heavy lines), noon positions 13 June-5 July 1975 (circles), and sea surface temperatures (°C). Routes between gill-net drift stations 13-24 June not shown.

Table 1. Daily totals of seabirds recorded within 300 m transects. Species seen outside transect width or hours are noted by +. Dashes indicate no observation of the species on that date.

	June																July															
Species	6	7	8	9	10	11	12W	12E	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	Total
Black-footed Albatross	—	1	2	3	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
Laysan Albatross	8	15	10	6	4	7	6	3	+	+	—	1	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60
Northern Fulmar	24	19	2	—	+	2	42	23	33	27	10	41	13	21	4	35	16	9	3	7	11	15	21	18	42	29	32	26	12	38	2	577
Sooty Shearwater	49	15	2	2	11	5	—	1	—	—	—	—	—	—	—	3	—	—	1	—	—	—	—	—	3	1	—	1	—	—	—	94
Short-tailed Shearwater	—	—	—	—	—	3	39	3077	1	2	—	—	3	62	—	12	6	6	+	13	6	8	1	5	53	57	15	83	23	422	101	3998
Sooty/Short-tailed Shearwater	—	2	—	—	—	6	14	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23
Mottled Petrel	—	—	2	—	1	14	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	2	—	—	—	—	—	22
Solander's Petrel	—	23	32	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	56
Kermadec Petrel?	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Cook's Petrel	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Cook's-type Petrel	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Shearwater/Petrel (sp.)	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Harcourt's Storm-Petrel	21	1		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22
Leach's Storm-Petrel	383	2	14	—	1	36	30	1	2	—	—	—	—	—	—	2	—	3	—	1	—	—	—	—	—	4	2	—	—	—	—	481
Harcourt's/Leach's Storm-Petrel	115	5	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	121
Swinhoe's Storm-Petrel?	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Tristram's Storm-Petrel?	—	6	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7
Fork-tailed Storm-Petrel	—	—	—	—	—	1	7	12	68	15	1	26	45	3	3	14	15	19	6	48	29	16	4	3	3	48	64	—	4	3	1	458
Red-faced Cormorant	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	+	—	—	4
Harlequin Duck	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Tattler (sp.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Pomarine Jaeger	—	6	2	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	6	4	2	2	—	—	4	4	—	33
Parasitic Jaeger	—	—	—	—	1	—	—	—	1	—	—	1	—	—	—	—	1	+	—	—	—	—	—	—	—	—	—	—	—	2	—	6
Long-tailed Jaeger	—	1	—	—	—	—	1	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Jaeger (sp.)	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
South Polar Skua	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Glaucous-winged Gull	—	—	—	—	—	—	—	—	12	2	—	—	3	1	+	1	—	—	—	—	—	—	—	+	+	—	4	15	6	7	4	55
Black-headed Gull	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1

Table 1 (cont.)

Species	June 6	7	8	9	10	11	12W	12E	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	July 28	29	30	1	2	3	4	5	Total
Black-legged Kittiwake	—	—	—	—	—	2	7	19	20	16	+	7	4	7	1	1	7	4	+	3	1	1	14	28	19	1	16	8	37	3	—	226
Red-legged Kittiwake	—	—	—	—	—	—	—	—	6	3	+	6	+	—	—	—	1	—	—	—	—	17	22	2	17	54	8	5	—	—	—	141
Sabine's Gull	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	+
Arctic Tern	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	—	—	—	—	—	—	1
Common Murre	—	—	+	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	79	86	3	1	+	12	13	—	196
Thick-billed Murre	—	—	—	—	—	—	—	—	2	1	—	3	2	2	—	2	—	1	1	—	—	1	1	178	76	1	2	165	4	—	—	442
Murre (sp.)	—	—	1	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	59	—	—	34	2	3	—	115
Pigeon Guillemot	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	2
Ancient Murrelet	—	—	—	—	—	—	—	—	—	+	—	—	3	16	+	2	—	6	—	—	—	—	—	—	—	—	—	4	4	—	2	37
Least Auklet	—	—	—	—	—	—	—	—	11	5	1	7	4	—	—	+	—	2	+	+	—	—	1	—	—	—	—	—	—	—	—	31
Crested Auklet	—	—	—	—	—	2	—	—	88	—	—	2	—	1	—	+	3	—	—	—	—	—	—	3	—	2	—	+	—	—	—	101
Whiskered Auklet	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Parakeet Auklet	—	—	—	—	—	—	—	—	57	1	—	17	4	1	—	—	—	—	—	—	—	—	—	2	2	—	—	—	—	3	—	87
Cassin's Auklet	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	+
Auklet (sp.)	—	—	—	3	—	—	—	—	42	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	46
Horned Puffin	—	—	2	—	1	4	—	1	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	5	—	—	—	—	6	—	19
Tufted Puffin	—	1	24	5	1	5	2	5	6	2	—	—	1	3	+	1	2	1	+	5	—	2	—	+	4	+	2	53	39	16	20	200
Total	600	100	97	22	23	87	149	3145	353	74	12	111	82	120	8	73	52	52	11	77	48	60	70	338	371	204	146	398	148	521	130	7682
Hours of systematic observation	3.5	6.1	5.1	7.0	6.8	6.6	6.9	3.5	3.8	3.5	1.1	3.3	2.0	1.8	0.3	3.0	2.0	2.8	1.0	3.7	4.7	4.0	3.8	2.8	4.7	3.5	1.8	3.2	4.8	5.0	0.5	

Table 2. Birds observed per 10 hours within 300 m transects, in each sea area.

Species/species groups	Oyashio/ Kuroshio Confluence	North-western Pacific	Offshore Aleutians	Pelagic Bering Sea	Bering Sea Continental Shelf
Albatrosses	24.5	9.6	+	–	–
Northern Fulmar	30.6	18.9	98.9	52.3	51.2
Shearwaters	46.3	52.6	1722.4	39.7	306.4
Gadfly petrels	39.5	6.3	–	1.4	–
Storm-petrels	374.1	29.1	87.4	73.9	39.2
Jaegers, skua	6.8	1.3	2.7	3.1	7.9
Glaucous-winged Gull	–	–	18.0	+	10.3
Kittiwakes	–	8.3	46.4	44.3	64.0
Murres	0.7	–	115.3	3.5	261.6
Small alcids	–	1.7	137.8	5.6	8.9
Puffins	18.4	6.3	38.3	3.8	45.3
Total birds/10 hours	540.8	134.1	2275.4[1]	227.9	814.8
Total area censused (km^2)	82.7	162.5	115.2	116.3	110.3
Birds/km^2	9.6	2.5	36.1[2]	5.6	15.0
Hours of systematic observation	14.7	30.2	18.3	28.7	20.3

1 Without shearwaters = 553.0 birds/10 hours
2 Without shearwaters = 8.8 birds/km^2

occurrences of birds noted beyond the 300 m transect width were recorded also. In addition, general data on environmental conditions, ship speed, course and position were obtained from the ship's log or officers on watch. Several transect counts were aborted when fog closed in to limit visibility, and observations were sometimes limited by wind-chill resulting from ship motion and air temperatures as low as 2.9° C. Identifications were aided by 10x50 binoculars.

The numbers of birds following the vessel were adjusted to represent minimum daily numbers (maximum numbers noted at any one time during a count period or series of consecutive count periods). However, no further allowances were made for effects of ship-attraction or repulsion on some species (which may cause overstatement of numbers of albatrosses, fulmars, storm-petrels, gulls or flying puffins) or for varying observability of alcids on the water (which can understate abundance relative to flying alcids or larger, more visible species). Manikowski (1971) reports that kittiwakes apparently accumulated at fishing vessels during the day, with maximum numbers present before dark. Similar possible variations in the Bering Sea are not taken into account here. Thus, calculations of "densities" are not attempted (see King 1970 and Wiens et al. 1977 for pertinent discussions of many factors involved). Physical oceanography sampling (including sea temperature and salinity bottle

casts), plankton sampling, and other experiments were made frequently beginning 12W June (12 June west of the 180° longitude date line), and these were the principal functions of the ship from 24 June through 4 July. Nine experimental salmon gill-net sets were made between 12E June and 24 June. The drift net (about 5 m deep and 5000 m long) was released just before dark and retrieved at first light.

RESULTS

Table 1 gives daily totals of birds observed within the 300 m transects and additional occurrences outside transects. Specimens salvaged from gill-net sets are given in Appendix 1. Relative abundances of species/species groups noted within sea areas are shown in Table 2 and Figures 3-16.

Table 3. Relative abundance of color phases of Northern Fulmars observed within transects, by sea area. Dark phase includes "black," dark and medium gray; light phase includes white bodied birds with gray or white wings.

Color Phase	Oyashio/ Kuroshio Confluence	North-western Pacific	Offshore Aleutians	Pelagic Bering Sea	Bering Sea Continental Shelf
Dark	100%	98%	98%	97%	80%
Light	–	2%	2%	3%	20%
Total birds (n)	45	57	168	151	142

Table 4. Relative abundance of kittiwakes observed within transects by sea area.

	Oyashio/ Kuroshio Confluence	North-western Pacific	Offshore Aleutians	Pelagic Bering Sea	Bering Sea Continental Shelf
Black-legged					
Adult	–	50%	58%	20%	66%
Immature	–	50%	21%	6%	13%
Red-legged					
Adult	–	–	11%	22%	18%
Immature	–	–	9%	52%	2%
Total birds (n)	–	28	75	127	130

SPECIES SEEN AT SEA

BLACK-FOOTED ALBATROSS *(Diomedea nigripes).* Very few were seen (Table 1). Sea surface temperature range was 6.0-10.2°C, with one seen at 4.3-4.9°C.

LAYSAN ALBATROSS *(Diomedea immutabilis).* Birds followed the ship almost continually in the Confluence area and Northwestern Pacific, and were attracted to gill-net hauls on several occasions. Ten at 50° 03'N, 178° 08'E on 12E June were the most seen at once, and two at 52° 50'N, 176° 10'W on 20 June were the most northerly recorded. Birds attempted to pull fish from the gill-net (to about 0.5 m below the surface) with little apparent success.

NORTHERN FULMAR *(Fulmarus glacialis).* The absence of birds in mid-Pacific (Figure 4) suggests that we had passed beyond the range of the northwestern Pacific breeding population. Kuroda (1960) saw fulmars offshore from the Kuriles and Kamchatka. Numbers increased on 12W June, and the species was common on almost all days thereafter. Dark-phase birds predominated, although most were noticeably lighter than birds seen on 6-8 June in the Confluence area, which were extremely dark ("black") birds. A generalized dark/light phase breakdown by sea areas is given in Table 3.

Shuntov (1972) indicates very few dark fulmars are found in the area of the Pribilofs at any time of the year. My sample was small and the Pribilofs themselves were fog-bound, but counts over the Bering Sea continental shelf within 140 km radius of the Pribilofs showed dark birds outnumbered light by about 2.6:1 (n=79), with light birds generally concentrated north of the islands. On nine counts over the pelagic Bering Sea waters, between 185-370 km northwest and southwest of the Pribilofs, dark birds outnumbered light by 16:1 (n=50). This distribution generally agrees with the findings of G. Hunt (pers. comm.). The presence of dark birds in the offshore areas could represent distribution of birds from "dark" colonies in the Aleutians.

Fulmars did not follow the ship in the Confluence or Northwestern Pacific areas and, while they were attracted to the stopped ship and were usually seen over the ship's wake in the Offshore Aleutians and Bering Sea areas, most appeared evenly distributed over the sea surface to the limit of vision. Census numbers were adjusted to maximum numbers seen in a count period or series of consecutive counts. During our nine early-morning net hauls, numbers present ranged from 5-77 birds. Stopped-ship counts later at oceanographic stations ranged from 0-200, with an average of about 10.

SOOTY SHEARWATER *(Puffinus griseus).* This species was recorded in the Confluence area and very small numbers were noted in flocks of the next species thereafter (see Table 1). The combined distribution of Sooty and Short-tailed shearwaters is shown in Figure 5.

SHORT-TAILED SHEARWATER *(Puffinus tenuirostris).* Large flocks were seen resting on the water near Amchitka Pass on 12E June, and concentrations were evident near Unimak Pass on 4-5 July, although visibility was greatly restricted. Small numbers were noted in the Pelagic Bering Sea, but numbers increased substantially over the Bering Sea Continental Shelf, after 28 June. Wiens et al. (1977) report no shearwaters over the Bering Sea Continental Shelf area near the Pribilofs in mid-June 1976; the species' arrival time in the area is evidently quite variable (see Shuntov 1972).

MOTTLED PETREL *(Pterodroma inexpectata).* Two birds moving north in the Confluence area on 8 June were the first noted, and some were seen in the Northwestern Pacific area (Figure 6). This agrees with general distribution given by Nakamura and Tanaka (1977). Several birds were seen in the Pelagic Bering Sea area, the most northerly being one at 55° 54'N, 179° 58'E on 25 June. These records accord with Shuntov (1972), Kuroda (1955), and Kenyon and Phillips

(1965). It now appears the species is quite widely distributed over the cooler North Pacific during its non-breeding season (Wahl 1975, Nakamura and Tanaka 1977, W. Hoffman unpubl. records) and also in the Sea of Okhotsk (Shuntov 1972).

SOLANDER'S PETREL *(Pterodroma solandri)*. This large gadfly petrel was seen in loose flocks on 7-8 June in the "warm" waters of the Confluence area (6.0-10.8°C occurrence range), usually foraging in rather slow circles, often high above the sea surface. (See Kuroda 1955, 1960 and Nakamura and Tanaka 1977).

KERMADEC PETREL *(Pterodroma neglecta)*? A bird seen briefly within 100 m at 42°01'N, 150°45'E in the Confluence area on 7 June showed head, body and underwing pattern described for the light phase of this species (see Slater 1970). Sea surface temperature was 5.7-6.2°C.

COOK'S PETREL *(Pterodroma cookii)*. One was closely seen at 45°57'N, 169°10'E on 10 June, over sea surface temperature of 4.0°C. Another bird, possibly *cookii*, was seen at 45°59'N, 168°19'E, also on 10 June, over sea surface temperature of 4.9-5.3°C.

HARCOURT'S STORM-PETREL *(Oceanodroma castro)*. Twenty-two of the white-rumped storm-petrels in the Confluence were identified as this species. Almost all storm-petrels there were flying to the east (see Kuroda 1960) into the wind, many failed to show species-characteristic flight styles, and hence were unidentifiable.

LEACH'S STORM-PETREL *(Oceanodroma leucorhoa)*. Large numbers were seen in the Confluence area on 6 June (Table 1, Figure 7). Numbers were then seen in the Northwestern Pacific area approaching the Aleutians, and several were seen over the deep waters of the Pelagic Bering Sea and southeast of the Pribilofs at the continental slope.

SWINHOE'S STORM-PETREL *(Oceanodroma monorhis)*? I saw one small all-dark storm-petrel at 42°12'N, 152°20'E on 7 June over sea surface temperature of 9.0°C. This species is the only small, dark-rumped storm-petrel described for the region (Alexander 1954).

TRISTRAM'S STORM-PETREL *(Oceanodroma tristrami)*? Seven large, all-dark birds seen in the Confluence on 7-8 June had a languid flight style reminiscent of the Black Storm-Petrel *(O. melania)* of the Eastern Pacific. Field marks distinguishing this from Matsudaira's Storm-Petrel *(O. matsudairae)* could not be seen due to distance and light conditions, but distributional range suggests *tristrami* (Palmer 1962, Slater 1970).

FORK-TAILED STORM-PETREL *(Oceanodroma furcata)*. This species first appeared in the Northwestern Pacific. Figure 8 shows the greatest concentrations near Amchitka Pass, over Petrel Bank north of the Aleutians, and southwest of the Pribilofs over the continental slope. This was the most abundant species in the Pelagic Bering Sea (Table 2) and was also quite consistently observed, along with fulmars and Black-legged Kittiwakes, in the Bering Sea Continental Shelf area. Along with those species, it was usually present (though often in small numbers) when fish were cleaned after gill-net hauls.

RED-FACED CORMORANT *(Phalacrocorax urile)*. Four were north of Bogoslof Island on 2 July and one was east-northeast of St. Paul Island in the Pribilofs on 3 July.

HARLEQUIN DUCK *(Histrionicus histrionicus)*. An immature male was observed swimming about the gill-net at 52°16'N, 178°40'W for about an hour on 17 June.

TATTLER *(Heteroscelus sp.)*. One bird passed the ship on 22 June, at 58°32'N, 176°43'W, headed northeast toward the Pribilofs. This was almost certainly the Wandering Tattler *(H. incanus)*.

POMARINE JAEGER *(Stercorarius pomarinus)*. Birds were seen in the Confluence, near the Aleutians, and especially near the Pribilofs and over the Bering

Sea Continental Shelf (Figure 9). Most were clearly attracted to kittiwakes attending our ship.

PARASITIC JAEGER *(Stercorarius parasiticus)*. Very few were seen (Table 1). One immature at 45°55'N, 168°13'E on 10 June was farthest west.

LONG-TAILED JAEGER *(Stercorarius longicaudus)*. Three adults were seen: one in the Confluence, one near Amchitka Pass, and one north of the Aleutians (Table 1).

SOUTH POLAR SKUA *(Catharacta maccormicki)*. A typical light phase bird with pale, straw-colored head was seen heading east at 42°06'N, 151°40'E on 7 June in the Confluence area.

GLAUCOUS-WINGED GULL *(Larus glaucescens)*. The low number of sightings was due to the generally inshore distribution during the season (see Shuntov 1972). The species is attracted to ships and often ranges far offshore during nonbreeding seasons (Sanger 1973 and pers. obs.).

BLACK-HEADED GULL *(Larus ridibundus)*. A bird in breeding plumage was seen on 13 June at 51°45'N, 180°00', headed northwest toward Semisopochnoi Island.

BLACK-LEGGED KITTIWAKE *(Rissa tridactyla)*. The species was seen daily after 11 June. Numbers followed the ship, checking the wake, scavenged fish offal, and gathered at oceanographic stations. Because both species of kittiwakes regularly followed the ship, transect counts were corrected to represent minimum numbers. However, relative abundances (Table 2) in the Pelagic Bering Sea and Bering Sea Continental Shelf areas were much greater than those given by Shuntov (1972). This could be due to proximity to colonies, seasonality, ship attraction behavior, inadequacies of census methods or sample size. Table 4 gives relative abundances of the two kittiwakes in the sea areas. Black-legs predominated in all areas except the Pelagic Bering Sea. Numbers at oceanographic stations in late June-early July were greater than numbers seen earlier at fishing stations north of the Aleutians. On 1 July about 120 Black-legs and 60 Red-legs, predominately adults of both species, flocked at one stop. No kittiwakes were noted on 4 transect counts east of 163°56'W (north of Amak Island) on 4 July.

RED-LEGGED KITTIWAKE *(Rissa brevirostris)*. Small numbers were seen in the Amchitka Pass area, and a few were noted when we passed within a few miles of Bogoslof Island. The largest numbers were present west and south of Pribilofs over the deep waters of the Bering Sea (Figure 11), where this species outnumbered *tridactyla* on 26, 27 and 30 June. Immature birds predominated over Pelagic Bering Sea waters (Table 4), which suggests a seasonal distribution of nonbreeders.

SABINE'S GULL *(Xema sabini)*. An immature was seen with a flock of kittiwakes resting near the ship on oceanographic station at 57°00'N, 168°30'W on 29 June.

ARCTIC TERN *(Sterna paradisaea)*. One was in the mid-Northwestern Pacific area on 10 June, and single birds were seen near the Pribilofs on 28 and 29 June.

COMMON MURRE *(Uria aalge)*. Total numbers of murres were low, likely reflecting inshore distribution near nesting colonies. Virtually all Common Murres were seen relatively near the Pribilofs (Figure 12). While some murres were unidentifiable as to species (Table 1), the blacker head and neck and generally heavier, shorter-necked appearance of the Thick-billed Murres made most birds within 300 m transects identifiable.

THICK-BILLED MURRE *(Uria lomvia)*. This species was more widely distributed than *aalge*. Almost all of the relatively few murres seen in the Pelagic Bering Sea were *lomvia*. However, the only large concentrations were noted near the Pribilofs and just north of Bogoslof (Figure 13). Murres noted outside the transect width and hours also followed these patterns. On several occasions near Bo-

goslof, long lines of flying Thick-billed Murres were seen following the lead of one or two Tufted Puffins.

PIGEON GUILLEMOT *(Cepphus columba)*. Three birds were noted (Table 1), all in breeding plumage. One inspected the gill-net for a few minutes on 17 June.

ANCIENT MURRELET *(Synthliboramphus antiquus)*. This easily identifiable species was seen primarily north of the central Aleutians (most were north of Adak Island), near Unalaska Island, and east of the Pribilofs.

LEAST AUKLET *(Aethia pusilla)*. Poor viewing conditions and unfamiliarity with the *Aethia* and *Cyclorrynchus* auklets resulted in my recording a number of unidentified "small dark alcids" both within and outside transects. The only noticeable concentrations of small alcids were near Amchitka Pass (Figure 14). The offshore cruise track and poor observation conditions near the Pribilofs and Unimak Pass probably reduced counts of small alcids more than other groups. Specimens of Least Auklets and other species salvaged from the gill-net are listed in Appendix 1.

CRESTED AUKLET *(Aethia cristatella)*. Two birds at 46°20'N, 171°36'E (about 685 km south of Attu Island) on 11 June were the first seen. Flocks were seen flying south near Amchitka Pass on 13 June.

WHISKERED AUKLET *(Aethia pygmaea)*. Only one bird was certainly identified, north of Adak on 18 June.

PARAKEET AUKLET *(Cyclorrynchus psittacula)*. As with other alcids, the only concentrations noted were in the Amchitka Pass area on 13 June.

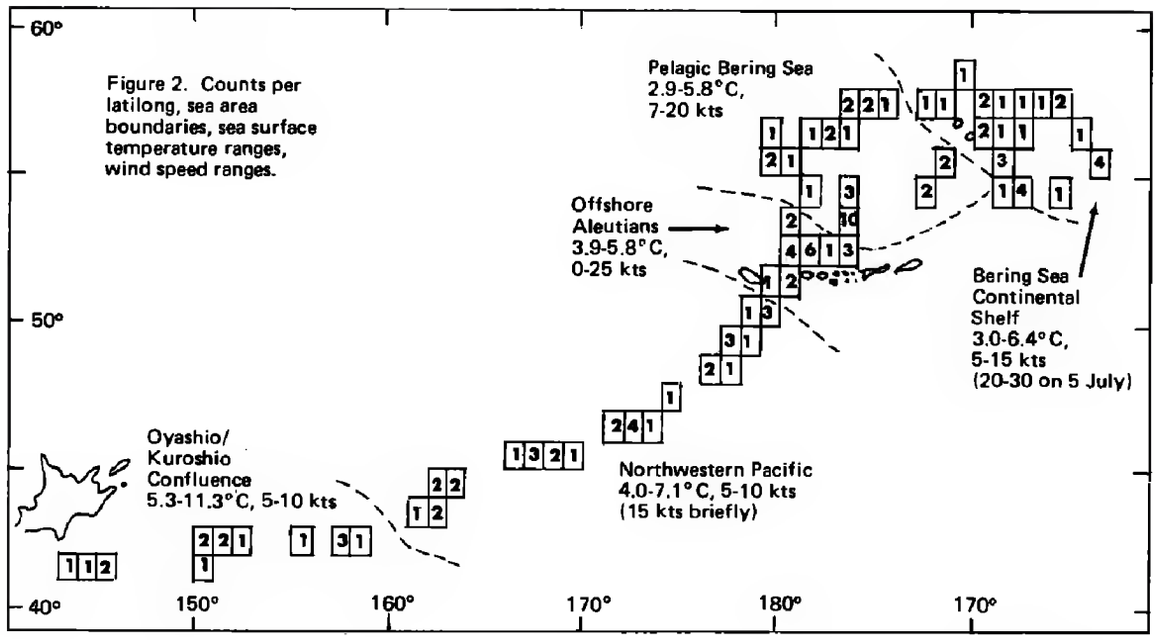
CASSIN'S AUKLET *(Ptychoramphus aleuticus)*. Although quite familiar with this species at sea, I did not identify it alive. Two specimens were taken from the gill-net (Appendix 1).

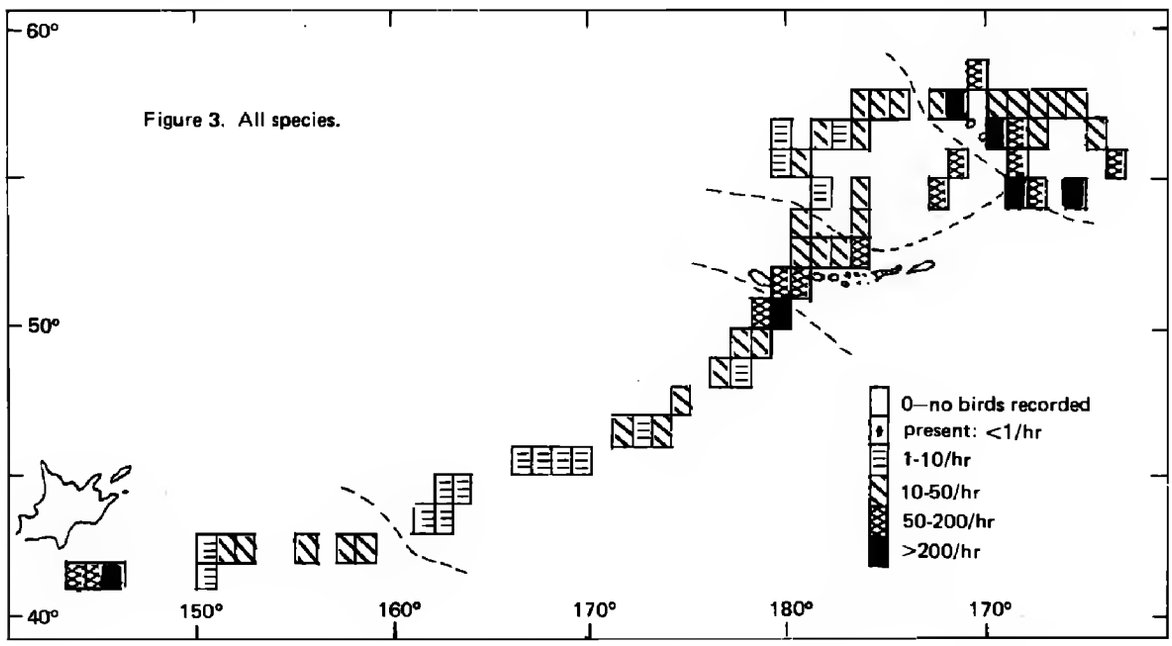
HORNED PUFFIN *(Fratercula corniculata)*. Two sub-adults were seen in the Confluence area, and flying birds in adult plumage were seen in the Northwestern Pacific area. The few other birds noted were in the Bering Sea Continental Shelf area (see Figure 15). In addition, five birds were seen in a transect count southeast of the Shumagin Islands on 6 July.

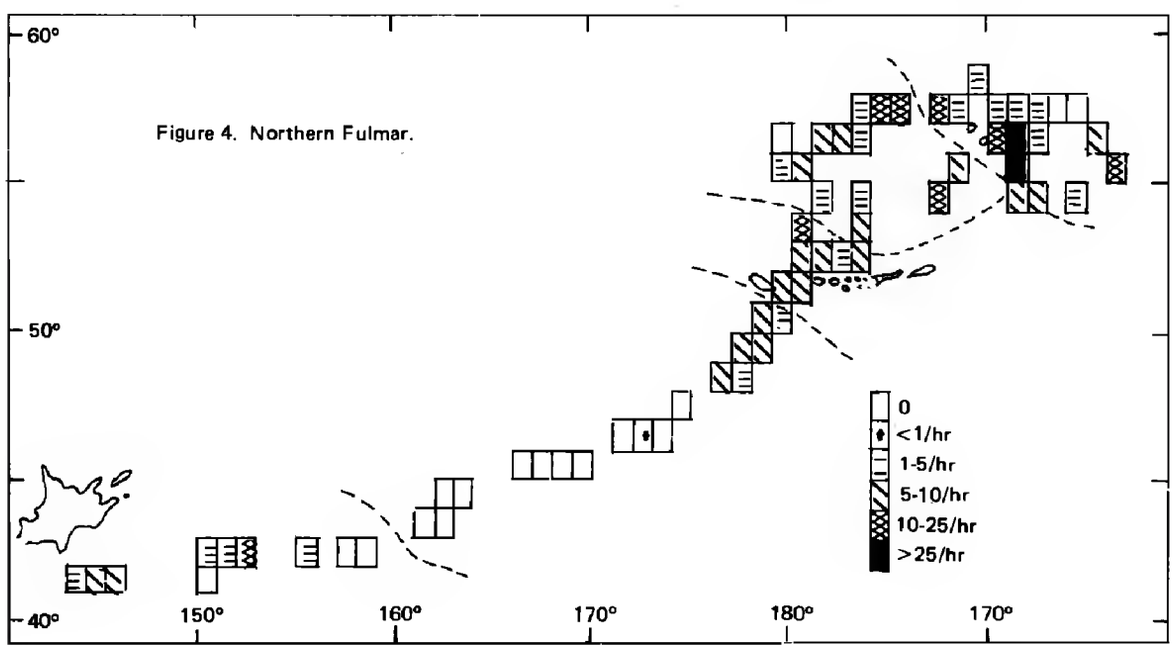
TUFTED PUFFIN *(Lunda cirrhata)*. A number of apparently flightless subadults were seen in the Confluence area. None of these birds were seen more than 100 m from the ship, and numbers shown for 7-8 June (Table 1) represent perhaps only 33-50% of their abundance relative to other species. Adult birds were seen almost every day from 9 June on, when the first two were seen at about 43°48'N, 161°53'E, 635 km from the nearest land in the Kuriles. Concentrations were seen near Bogoslof, east of St. George Island, northwest of Unimak Island, and at the northern entrance to Unimak Pass (Figure 16). Large numbers were seen also near the Shumagins and Kodiak. The species is attracted to vessels (see Kuroda 1955), and any calculation of absolute density must allow for this and its habit of flying higher above the sea surface than other alcids. The only sub-adult seen outside of the Confluence area was one at 54°26'N, 177°00'W on 24 June.

OTHER SPECIES

Several additional seabird species were seen on 5 July in inshore Hokkaido waters: Streaked Shearwater *(Calonectris leucomelas)*, Flesh-footed Shearwater *(Puffinus carneipes)*, Japanese Cormorant *(Phalacrocorax capillatus)*, Slaty-backed Gull *(Larus schistisagus)*, Black-tailed Gull *(L. crassirostris)* and Rhinoceros Auklet *(Cerorhinca monocerata)*. Additional species noted between Unimak Pass and Kodiak on 5-8 July included Pelagic Cormorant *(Phalacrocorax pelagicus)*, Common Eider *(Somateria mollissima)*, Herring Gull *(Larus argentatus)*, Mew Gull *(L. canus)*, Aleutian Tern *(Sterna aleutica)*, Marbled Murrelet *(Brachyramphus marmoratus)* and Kittlitz' Murrelet *(B. brevirostris)*.


60°
50°
40°
150°
160°
170°
180°
170°
Figure 2. Counts per latilong, sea area boundaries, sea surface temperature ranges, wind speed ranges.
Pelagic Bering Sea
2.9-5.8°C,
7-20 kts
Offshore
Aleutians
3.9-5.8°C,
0-25 kts
Bering Sea
Continental
Shelf
3.0-6.4°C,
5-15 kts
(20-30 on 5 July)
Oyashio/
Kuroshio
Confluence
5.3-11.3°C, 5-10 kts
Northwestern Pacific
4.0-7.1°C, 5-10 kts
(15 kts briefly)


60°
50°
40°
150°
160°
170°
180°
170°
Figure 3. All species.
0—no birds recorded
present: <1/hr
1-10/hr
10-50/hr
50-200/hr
>200/hr


60°
50°
40°
150°
160°
170°
180°
170°
Figure 4. Northern Fulmar.
0
<1/hr
1-5/hr
5-10/hr
10-25/hr
>25/hr

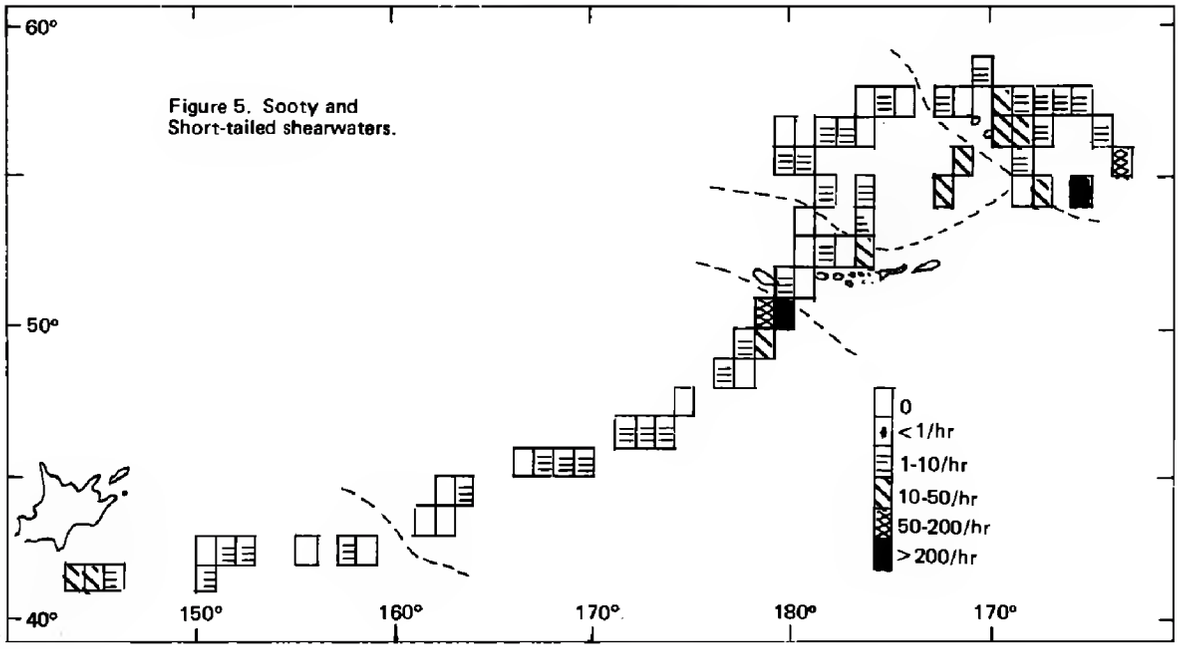


Figure 5. Sooty and Short-tailed shearwaters.

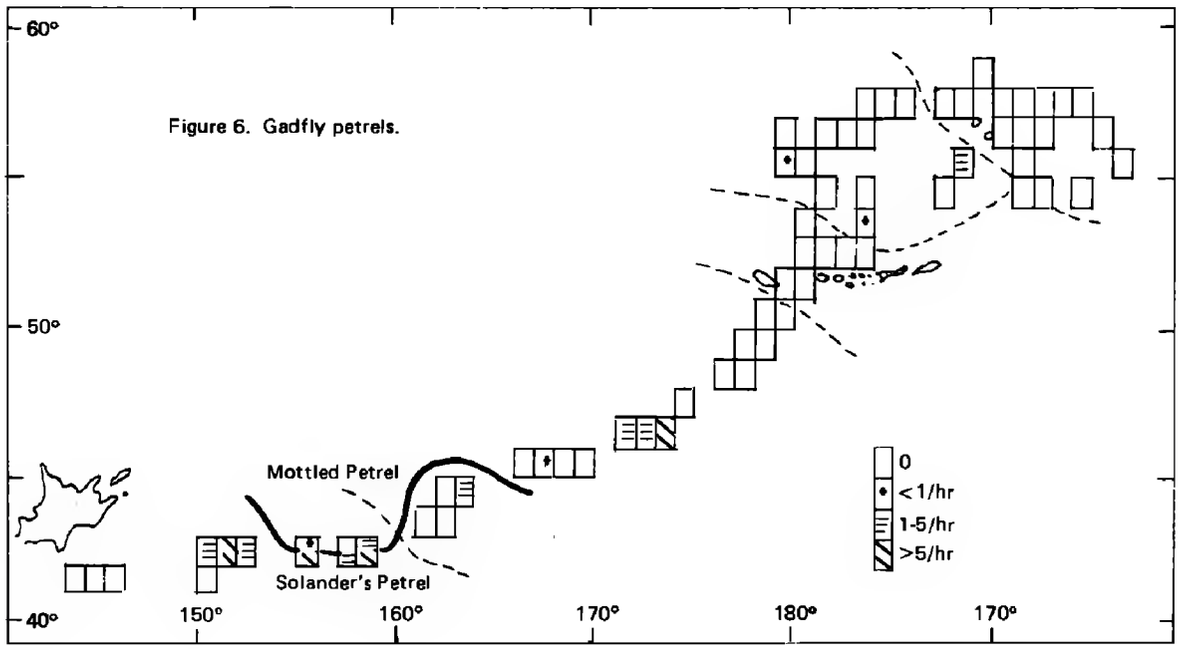


Figure 6. Gadfly petrels.

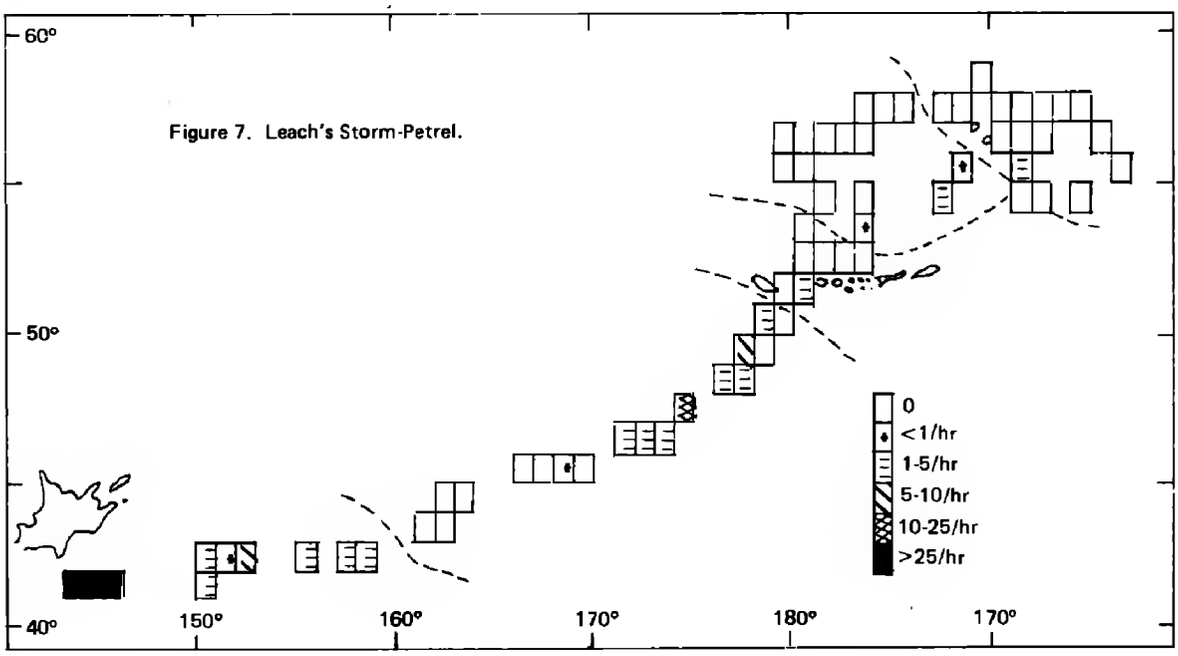


Figure 7. Leach's Storm-Petrel.

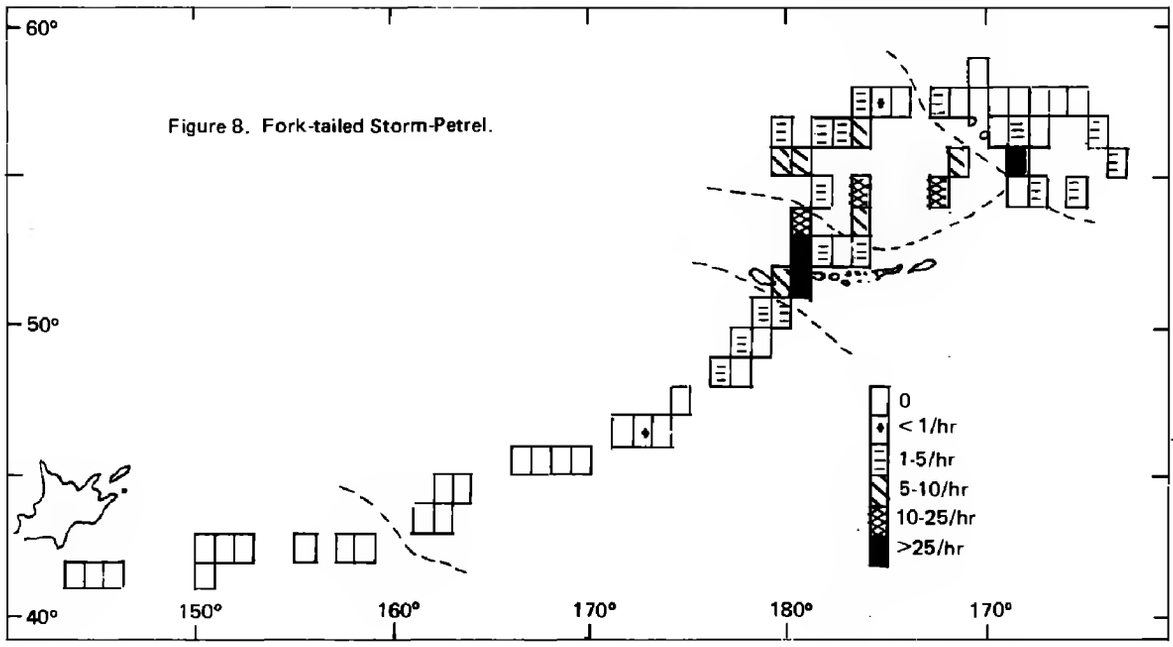


Figure 8. Fork-tailed Storm-Petrel.

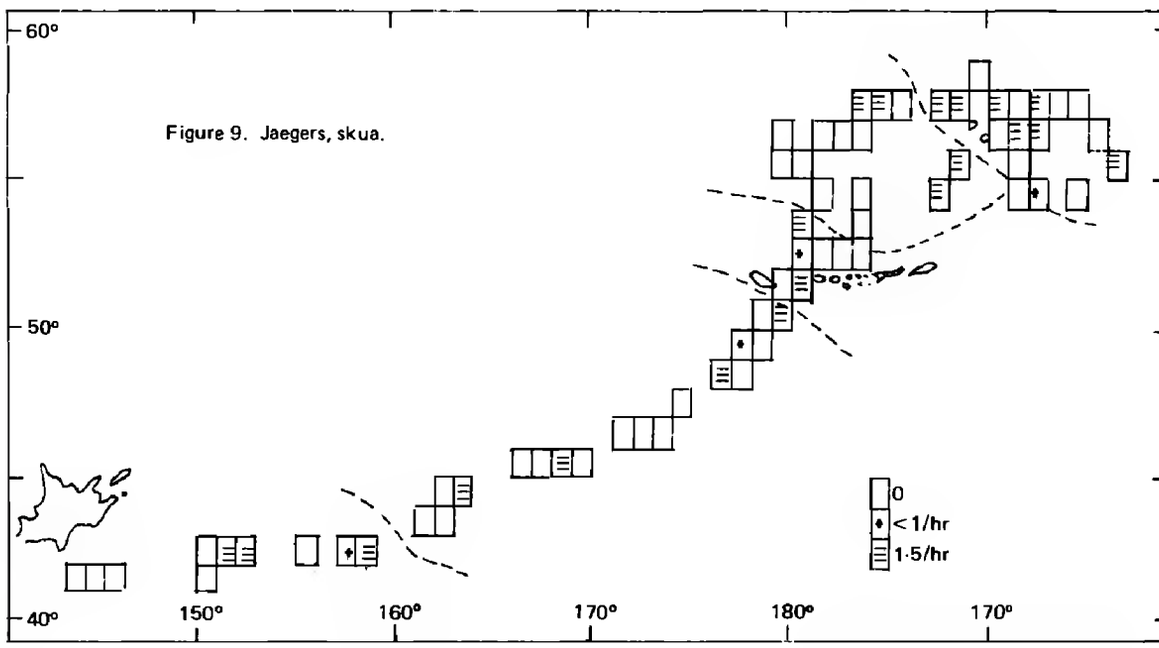


Figure 9. Jaegers, skua.

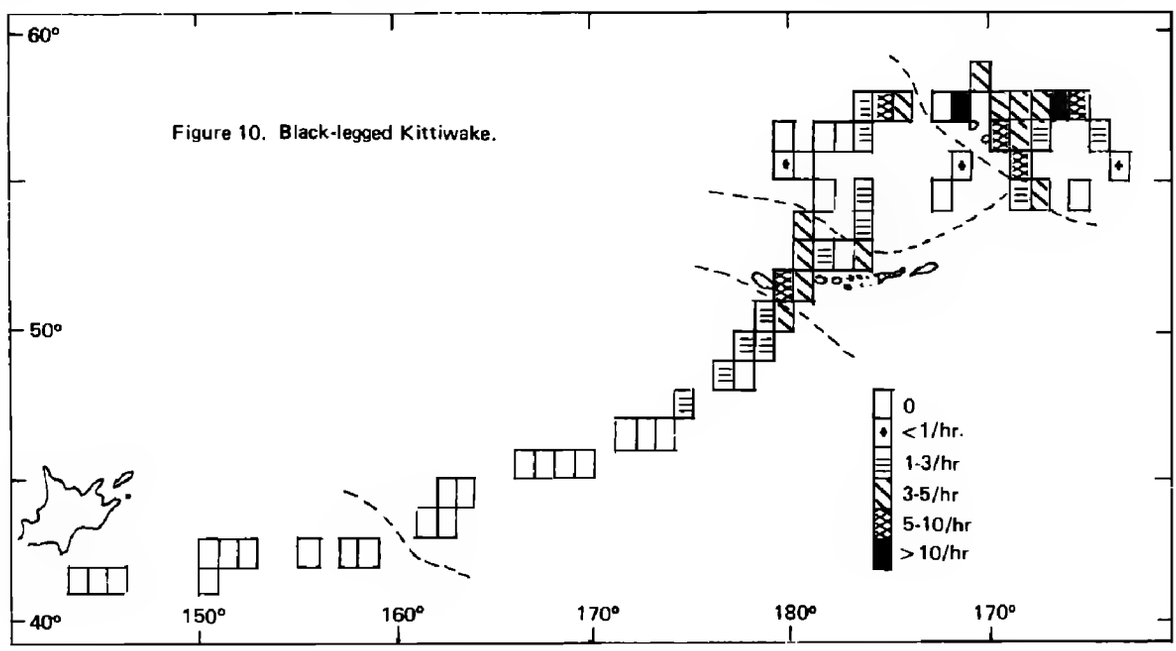


Figure 10. Black-legged Kittiwake.

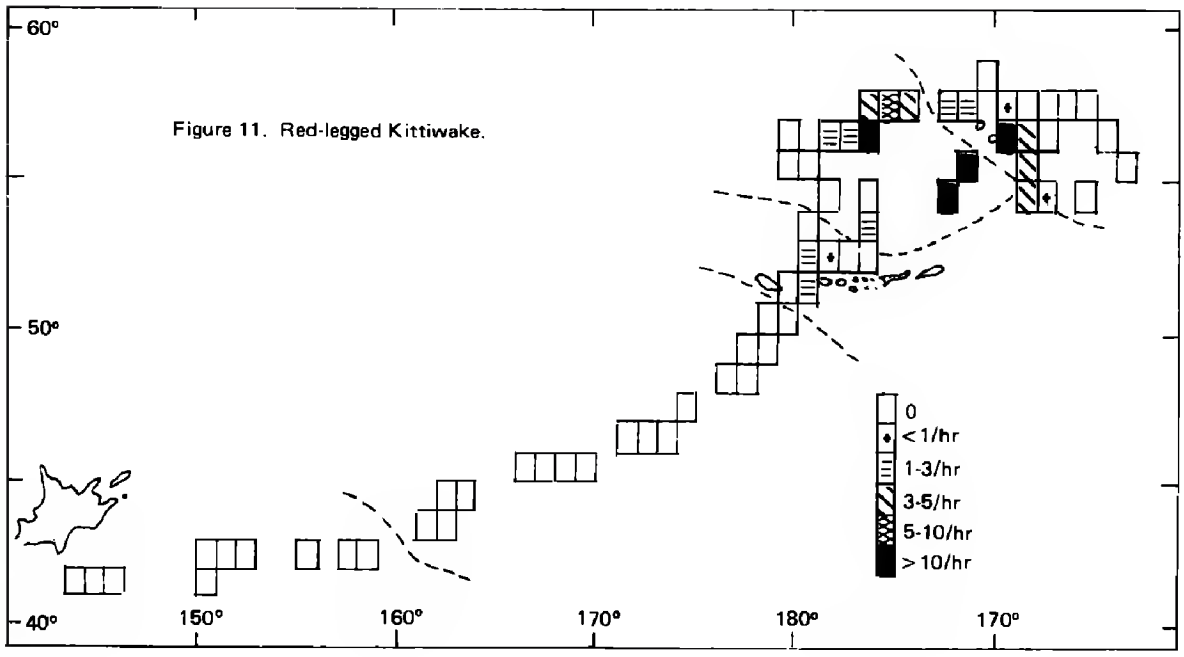


Figure 11. Red-legged Kittiwake.

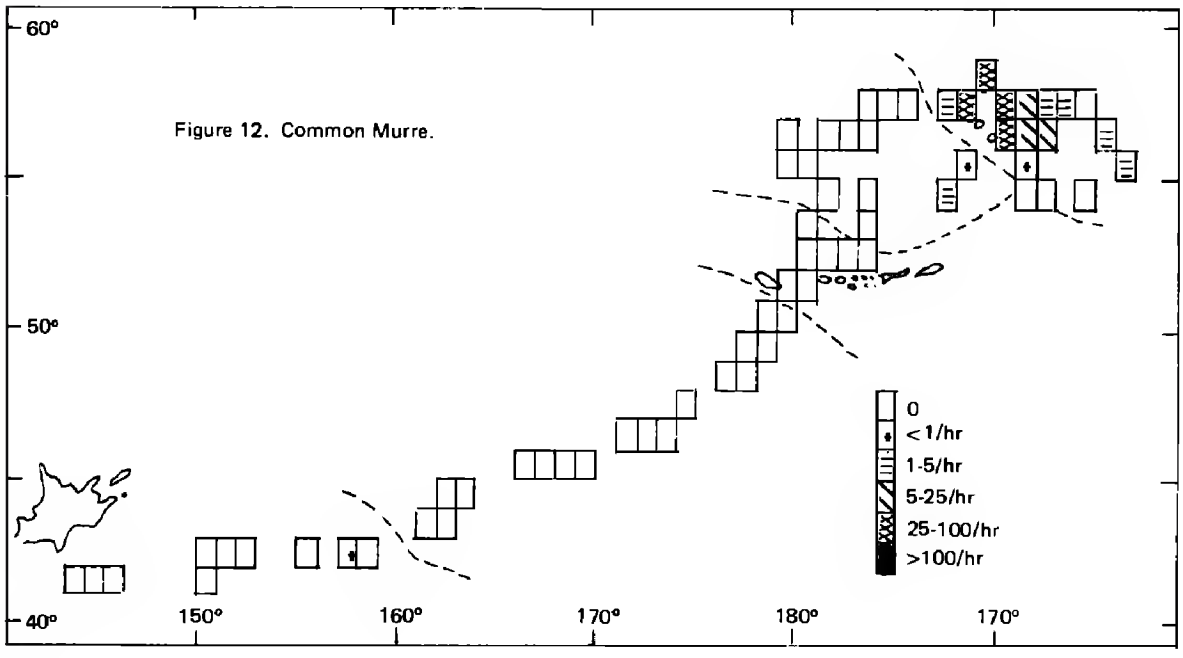


Figure 12. Common Murre.

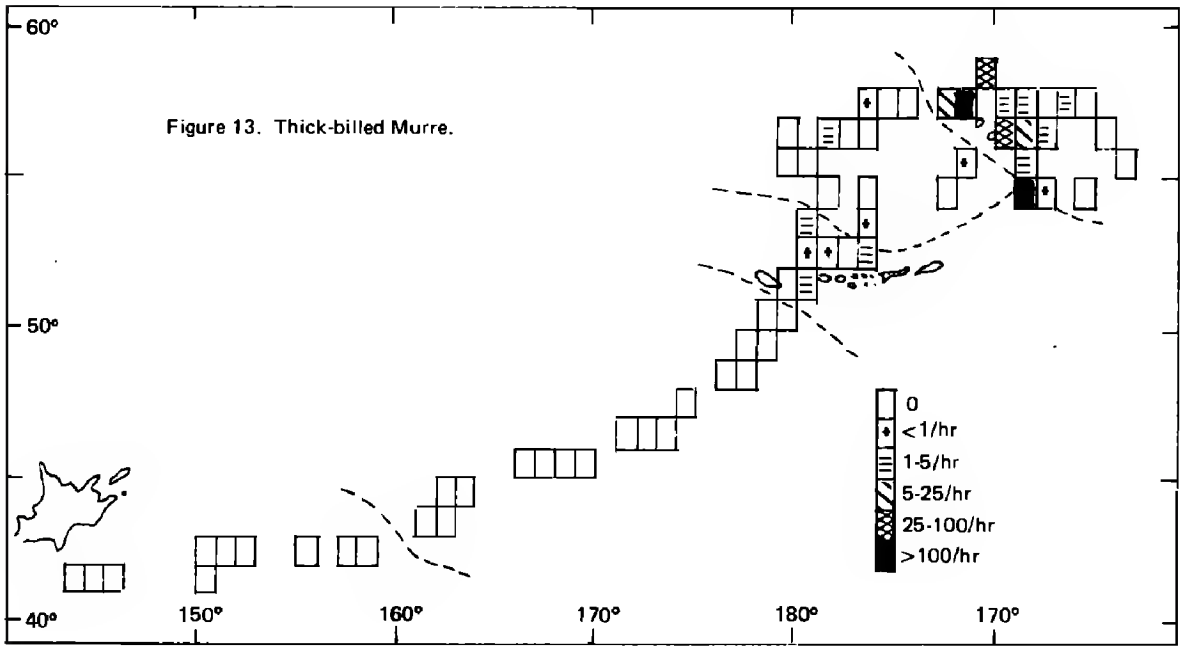


Figure 13. Thick-billed Murre.

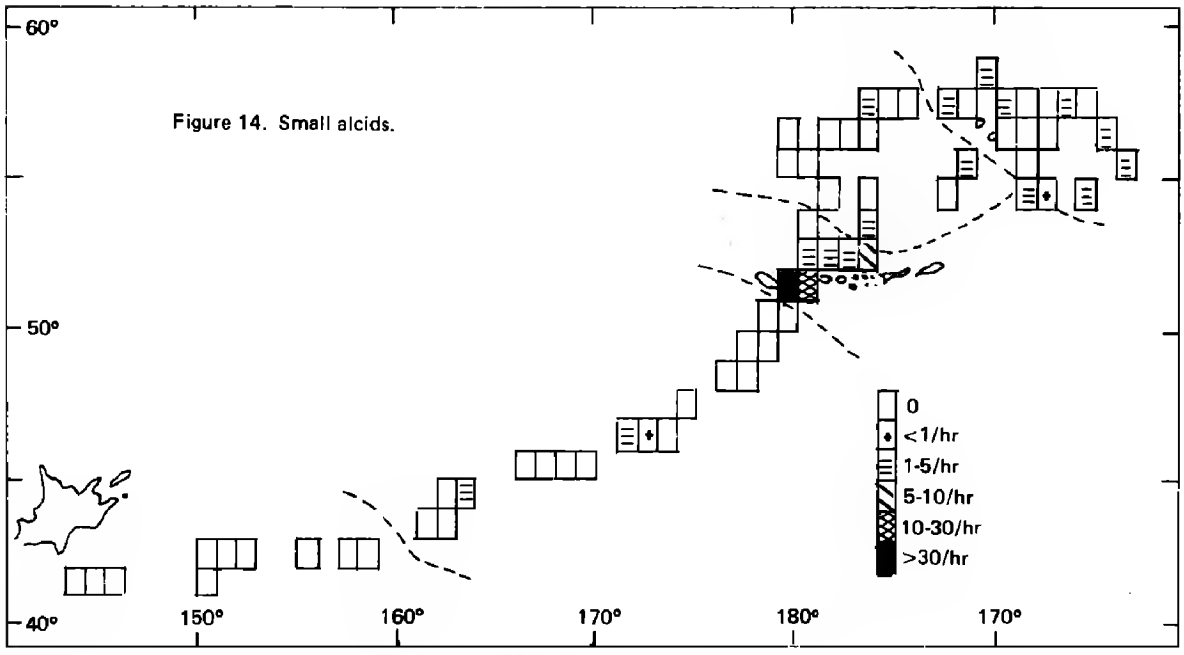


Figure 14. Small alcids.

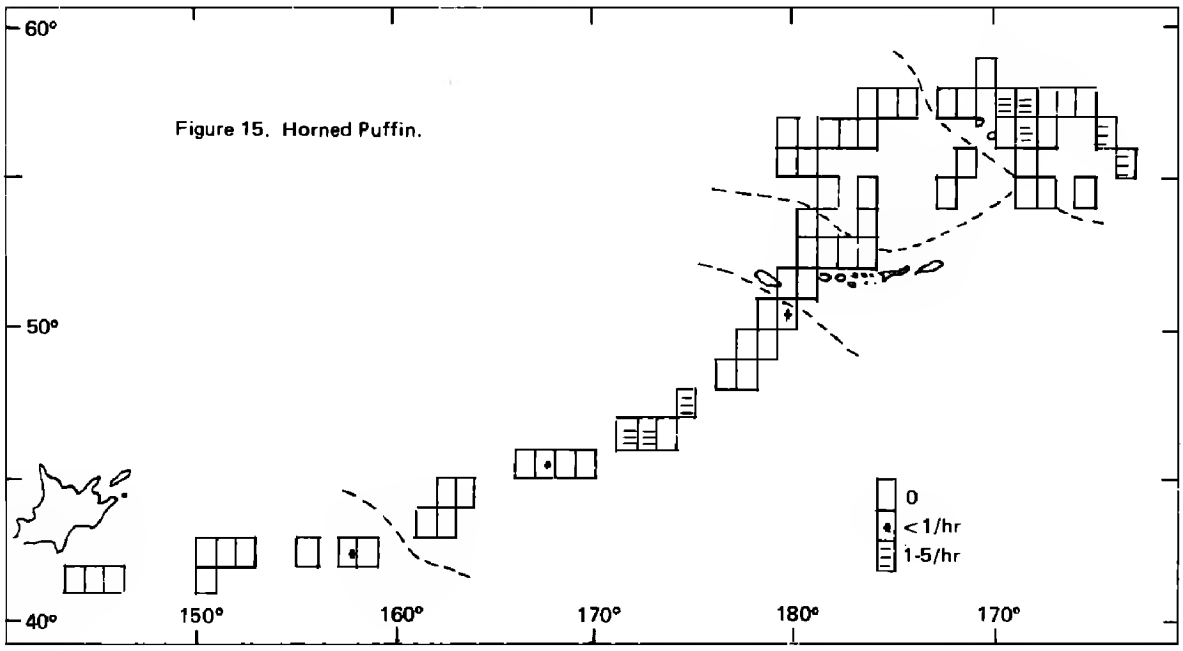


Figure 15. Horned Puffin.

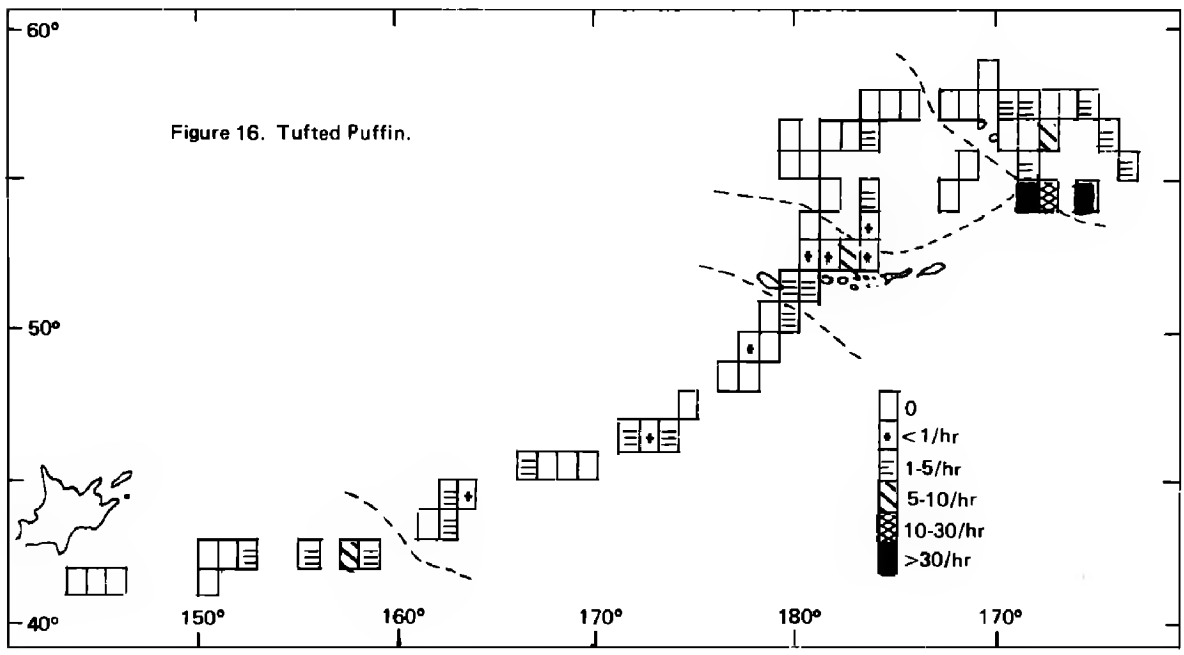


Figure 16. Tufted Puffin.

The only passerine seen on the cruise was one female Common Redpoll *(Acanthis flammea)* which came on board in dense fog between St. Paul and St. George islands on 29 June and stayed at least until dark.

Marine mammals identified during the cruise were Northern Sea Lion *(Eumetopias jubata)*, Northern Fur Seal *(Callorhinus ursinus)*, 15-20 Killer Whales *(Orcinus orca)* near Kodiak Harbor on 8 July, Dall Porpoise *(Phocoenoides dalli)* which was widely distributed over the cruise route, and 3 Fin Whales *(Balaenoptera physalus)* southwest of Kodiak Island on 6 July.

DISCUSSION

Ideally, replicate data are disirable to describe bird distribution in sizable areas of the oceans. However, data from a single cruise are useful when they add some specifics where broad generalizations had to serve previously. Since the present cruise track was at least several miles offshore, even in Amchitka Pass, transect counts were little influenced by large numbers of birds close to colonies. No large concentrations of birds at fishing fleets were encountered and, although one large flock was observed within a transect, data are felt to be fairly representative of "open water" abundance in June. Relatively little migration of species nesting in the northern hemisphere was noted.

OYASHIO/KUROSHIO CONFLUENCE

The cruise track crossed the northern edge of the area where the cold Oyashio current and the warm Kuroshio current meet in the western Pacific. Sea surface temperatures (which were 12.8-13.6°C on 5 June leaving Japan) ranged from 5.3-11.3° C on 6-8 June (Figure 2), with changes of as much as 1.2° C within one hour. Frequent periods of dense fog greatly restricted hours of systematic observation, but counts and extra-transect observations indicated that birds were abundant in the area (Figure 3), particularly gadfly petrels and storm-petrels. Laysan Albatrosses, fulmars and shearwaters were also numerous, as were sub-adult Tufted Puffins (Table 2). Albatrosses were the only birds attracted to the ship, as we crossed this area without stopping. Sea surface temperatures along our track were below the temperatures (up to 16°C) in the part of the Confluence area visited by Kuroda (1955, 1960), and the main populations of "warm water" species were undoubtedly farther south.

I have found no ornithological descriptions of this interesting area, other than reports by Kuroda (1955, 1960), Hamilton (1958) and Nakamura and Tanaka (1977). Hamilton's (1958) brief sightings suggest that noticeable concentrations of birds occur east to at least 180° longitude in June. Personal observations (unpubl.) along 158° W in late October-early November suggest similar if less dramatic conditions there. Sanger (1972) does not estimate seabird abundance for the Confluence area. He estimates 4.5 birds/km^2 for the Transition Domain. My figure of 9.6/km^2 (Table 2) for the Confluence area is considerably higher and

does not seem unrealistic, although biomass is likely low because of the large numbers of small-bodied storm-petrels. Shuntov (1972) mentions the area but gives no data on abundance.

Kuroda (1955) saw both Buller's Shearwaters *(Puffinus bulleri)* and Japanese Murrelets *(Synthliboramphus wumizusume)* in waters east of Japan, and their absence on this cruise was probably a reflection of the cool surface waters along our northerly track over the Confluence (Kuroda reported *bulleri* over sea surface temperatures of 14.5-16.0°C; our maximum was 11.3°C in the Confluence). A number of authors have demonstrated a distribution of species relative to surface temperatures, salinity and associated food sources (e.g., Murphy 1936, Kuroda 1955, 1960, Szijj 1967, Gould 1971, Jehl 1973). The most common species encountered on this cruise were widely distributed over the entire range of sea surface temperatures, and species preferring warm waters were obvious only in the Confluence area (e.g. Solander's Petrel, Harcourt's Storm-Petrel). This area has been described oceanographically (see Favorite et al. 1976), and Ashmole (1971) and Gould (1971) describe the concentration of planktivores along boundaries of converging water masses. An intensive study of birds vs. oceanographic conditions here might provide interesting insights.

NORTHWESTERN PACIFIC

Sea surface temperatures decreased fairly steadily as the *Oshoro Maru* cruised northeastward toward the Aleutians. The numbers of birds observed per km^2 dropped to about 25% of the number observed in the Confluence area. My figure of 2.5/km^2 is in general agreement with the figure of 3.1/km^2 given by Sanger (1972) for this area. Shuntov's figure for the "open ocean" area of the "northwest part of the Pacific Ocean" south to 30°N is 1.6/km^2. My personal observation (unpubl.) is that abundances decrease greatly south of the Subarctic Boundary at about 40°N. Relatively low populations of birds between 30° and 40°N could explain Shuntov's lower figure. Kuroda (1955, 1960) indicated higher densities near the Kuriles and Kamchatka compared to my count numbers from farther south and east. Shearwater numbers increased, and kittiwakes and small alcids appeared as we approached the Aleutians. Laysan Albatrosses were the only ship followers within this area, as they had been in the Confluence. Other species ignored our non-stop passage.

OFFSHORE ALEUTIANS

Trapp (1975) presents data pertinent to this area, and Gabrielson and Lincoln (1959) and Murie (1959) give information from inshore observations. Sanger (1972) gives a summer figure of 7.8 birds/km^2 for the Coastal Domain, and Shuntov (1972) gives a figure of 11/km^2 for

the Offshore Aleutians area for June-August. My figure of 36.1/km^2 (Table 2) includes a flock of 3000 Short-tailed Shearwaters which greatly affects both relative abundance and bird/km^2. Disregarding shearwaters, my figure would be 8.8/km^2, which agrees well with Sanger and Shuntov. Compared to the Northwestern Pacific area, my actual numbers of all species except albatrosses and gadfly petrels increased substantially within this area. Birds/hour for all species combined (Figure 3) are influenced primarily by numbers of shearwaters and Fork-tailed Storm-Petrels and numerous small alcids in the area near Amchitka Pass (Figures 5, 8, 14).

PELAGIC BERING SEA

Fork-tailed Storm-Petrels, Northern Fulmars, kittiwakes and Short-tailed Shearwaters accounted for over 90% of the birds recorded. As in the Offshore Aleutians area, fulmars, Fork-tails and kittiwakes were attracted to gill-net operations. Sanger (1972) includes this area within the Western Subarctic Domain and estimates a summer abundance of 3.1 birds/km^2, and Shuntov (1972) gives 2.7/km^2 for June-August. My figure is 5.6/km^2; the variation may be due in part to differences in geographic designations, methodology and allowances for ship-attraction. Variation in species composition, seasonal distribution, air and water temperatures probably justify study of this ornithologically-neglected area as an entity separate from other deep-water areas of the North Pacific.

BERING SEA CONTINENTAL SHELF

Data were gathered in this area (Table 2, Figure 3), but periods of dense fog on 29 June and 20-30 knot winds and blowing spray combined with fog on 5 July near Unimak Pass reduced both the number of near-shore transects and birds recorded. Compared to the Pelagic Bering Sea, the numbers of Short-tailed Shearwaters and murres increased over the shelf, and storm-petrels showed a relative decrease. Birds/km^2 were probably equal to those of the Offshore Aleutians area. Large numbers of Short-tailed Shearwaters and Tufted Puffins occurred near Unimak Pass during a brief count on 5 July. However, abundances over the continental shelf, as in other areas, were not uniform: two counts about 330 km east-northeast of the Pribilofs on 3 July indicated relatively low numbers of birds there.

Sanger (1972) estimates 7.8 birds/km^2 for all species for the Coastal Domain, in which he includes the Bering Sea Continental Shelf. Shuntov (1972) gives 18 birds/km^2 for June-August. Wiens et al. (1977) noted no shearwaters in June counts, but tentatively estimate about 12 birds of all species/km^2. Their counts probably included many more breed-

ing birds around the Pribilofs than my counts did, however. My figure of 15/km^2 (Table 2) is given for comparison.

As noted above, we did not encounter working commercial fishing vessels on this cruise. The effects of very large concentrations of birds found at fishing vessels on calculated densities of birds for a large area are unknown. However, overall numbers of birds/km^2 in areas where extensive trawling and processing operations have been conducted for years could be both greater over the area as a whole and more locally variable when compared to areas where fishing effort has been less intensive (see Shuntov 1972). The lack of replicate data prevents allowance for effects of weather systems on bird distribution. Manikowski (1971) reports considerable variation in seabird distribution and behavior under different meteorological conditions and these could influence data given here, especially for the Pelagic Bering Sea and Bering Sea Continental Shelf areas.

SUMMARY

Censuses of seabirds seen on a cruise from Hokkaido to Kodiak in June 1975 provided data on relative abundance, particularly for three areas of the North Pacific Ocean which have had little prior study: the Confluence, the Northwestern Pacific, and the Pelagic Bering Sea. Birds were numerous in the Confluence, with abundances of Solander's Petrel, Leach's Storm-Petrel and sub-adult Tufted Puffins being particularly noteworthy. Abundances were relatively low in the Northwestern Pacific area, with Short-tailed Shearwaters and Leach's Storm-Petrels the most numerous species noted. Northern Fulmars, Short-tailed Shearwaters, Fork-tailed Storm-Petrels and kittiwakes predominated over the deep waters of the Pelagic Bering Sea. The numbers of immature Red-legged Kittiwakes noted over the deep waters southwest of the Pribilofs may be representative of the distribution of non-breeders in June. Dark-phase Northern Fulmars substantially outnumbered light-phase birds in all areas, including sample counts near the Pribilofs. The large numbers of birds close to nesting colonies were not censused due to the offshore cruise track. The greatest concentrations of offshore birds were noted in the Confluence, near Amchitka Pass, near the Pribilof Islands, and in waters over the continental shelf north of Unimak Pass.

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APPENDIX 1

Specimens retrieved from gill-net operations. Approximate locations: 13 June—50°44'N, 179°59'E; 14 June—52°19'N, 178°54'W; 17 June—52°16'N, 178°40'W; 18 June—52°32'N, 177°40'W; 20 June—52°50'N, 176°10'W; 23 June—53°50'N, 176°43'W; 24 June—53°30'N, 176°42'W. Specimens noted HU to Hokkaido University, Faculty of Fisheries; specimens destroyed for heavy metals analysis. Specimens noted UW to University of Washington, Burke Memorial Washington State Museum; specimen numbers follow.

Short-tailed Shearwater: 13 June, HU-1; 20 June, UW CEC 06, 07, 13; 24 June, HU-1. Thick-billed Murre: 13 June, HU-1; 14 June, HU-2; 17 June, HU-3; UW JR 211-214; 20 June, HU-1. Ancient Murrelet: 14 June UW JR 215; 18 June, UW CEC 03. Least Auklet: 20 June, UW CEC 08; 23 June, UW CEC 05, 10. Crested Auklet: 13 June, HU-2; UW CEC 01, 02, 11; 20 June, UW CEC 12. Cassin's Auklet: 20 June, UW CEC 09; 24 June, UW CEC 04. Horned Puffin: 20 June, HU-1. Tufted Puffin: 13 June, HU-1; 14 June, HU-1; 18 June, UW CEC 14.

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APPARENT RESPONSE OF *PICOIDES* WOODPECKERS TO OUTBREAKS OF THE PINE BARK BEETLE

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In their discussion of the Northern Three-toed Woodpecker *(Picoides tridactylus)*, Bailey and Niedrach (1965:507) stated: "This species, with the Downy [*Picoides pubescens*] and Hairy [*P. villosus*] Woodpeckers, was a great help in the preservation of the forests in western Colorado threatened by the destructive bark beetles in 1939." They went on to quote a statement by Noel D. Wygant regarding this event: "In some of the large outbreak centers, woodpeckers built up a population as heavy as a pair per acre."

Since 1939, numerical responses of picids to insect infestations have been noted repeatedly. For example, Blackford (1955) reported a large increase of woodpeckers, especially *P. tridactylus*, during the fall and winter following a forest fire in a Douglas-fir *(Pseudotsuga menziesii)* and Ponderosa Pine *(Pinus ponderosa)* forest in Montana. Presumably, the woodpeckers were responding to increased populations of prey species, particularly boring beetles. Woodpeckers had declined to normal numbers by March, however, and did not re-invade during the following cold season.

The observed population increases of Northern Three-toed, Hairy, and Downy woodpeckers in apparent response to bark beetle *(Dendroctonus* spp.) infestations in Colorado are of special significance. Most published reports have dealt with outbreaks of the Spruce Bark Beetle (*D. rufipennis* Kirby) in Engelmann Spruce *(Picea engelmannii)* stands in subalpine spruce-fir forests (Hutchinson 1951, Yeager 1955, Knight 1958, Amman and Baldwin 1960, Baldwin 1960, Koplin 1969 and 1972, Koplin and Baldwin 1970). Although three widely separated areas were discussed in these papers, five major similarities are evident:

(1) The woodpeckers that responded to bark beetle epidemics were *P. tridactylus*, *P. villosus*, and *P. pubescens*, in decreasing order of abundance.

(2) The increases in population were most significant in the non-breeding season, although some higher breeding densities were noted in large, long-term (panepidemic) areas. That is, immediate responses resulted from aggregation or immigration.

(3) Bark beetle adults and larvae formed the major winter food source for the three picids in infested areas (67-99 percent of stomach contents).

(4) Woodpecker activity resulted in 45-98 percent decreases in beetle survival. Beetle mortality was related to predation by picids or to freezing, desiccation, parasites, and insect predators following removal of bark by picids.

(5) Secondary infection by other boring beetles, such as *Pityophthorus occidentalis* and *Ips pilifrons*, may affect trees weakened by *Dendroctonus* attack. Secondary borers likely lead to increased intensity and duration of woodpecker response.

The 1975 and 1976 Audubon Christmas Bird Counts in Boulder, Colorado, have provided tentative evidence of a similar invasion by *Picoides* woodpeckers in response to an increasingly severe outbreak of the Pine Bark Beetle *(D. ponderosae)*. This outbreak has affected Ponderosa Pine primarily in overcrowded stands characterized by reduced vigor and, presumably, decreased resistance to attack.

The apparent response of picids to the Pine Bark Beetle is indicated by two major trends. The first trend is the expansion of *P. tridactylus* into montane pine from higher subalpine spruce-fir, where it normally occurs (Bailey and Niedrach 1965, Bock and Bock 1974). Indeed, 1975 and 1976 mark the first recorded occurrences of *P. tridactylus* on Boulder Christmas Bird Counts. We have observed this picid in other bark beetle-infested stands of Ponderosa Pine throughout the Front Range. Perhaps this niche expansion should be expected, since three-toed woodpeckers are generally regarded as opportunistic, irruptive species (Blackford 1955, Bock and Bock 1974).

The second trend is the increase in numbers of Hairy and Downy woodpeckers during winters since 1972, when the outbreak reached major proportions. Christmas Bird Count data must be analyzed carefully because of yearly differences in the number of observers and the distances covered; however, these difficulties can be overcome to some extent through careful interpretation. Other factors influencing raw data are count-day weather, amount and types of habitat covered, and general expertise of the participants. However, we do not feel that the latter two factors have varied markedly in recent years, and our own experience suggests that counts of picids are less affected by weather than counts of most species. Nevertheless, augmentive data are always desirable, and we have therefore surveyed Ponderosa Pine woodlands west of Boulder repeatedly since the 1976 Christmas Bird Count.

During the 25-year period 1951-1976, there was a close correlation between numbers of observers and numbers of *Picoides* on Christmas Bird Counts. From 1972 to 1976, however, observers in Boulder increased 308 percent, while *Picoides* increased by 589 percent. A similarly disproportionate rise in picid observations is shown by comparing the ratio of *Picoides* observed to party miles. From 1951 through 1971,

the average ratio was 0.04, with a high of 0.11 in 1965 and 1967 and a low of 0.02 in 1963. During the 1972-1976 interval, this ratio averaged 0.14, having increased to 0.20 in 1975 and 0.23 in 1976. Thus, since the bark beetle outbreak began, numbers of *Picoides* have increased nearly twice as fast as observers, and approximately 3.5 as many have been seen per party mile as during the previous twenty years.

Of course, the relative amount of suitable habitat surveyed each year would also affect Christmas Count findings. Unfortunately, habitat proportions were not recorded between 1956 and 1972. Even when habitat proportions were noted, however, the data were not organized to show how many woodpeckers were observed in each habitat type, and valid comparisons are therefore not possible.

Although detailed habitat utilization data are not yet available for the Boulder area, the preference of picids for bark beetle-infested areas during 1976-77 was inarguable. Of 48 Hairy and Downy woodpeckers observed in our study area on the western flanks of South Boulder Peak, none was seen in an uninfested area. Moreover, uninfested areas (more than one-half of the total) were essentially devoid of woodpeckers, except for the ubiquitous Common Flicker *(Colaptes auratus cafer).* This clumped distribution has been repeatedly observed in the area since the 1976 Christmas Bird Count. Indeed, clumping was so extreme that on three occasions we observed two Hairy and two Downy woodpeckers working diligently in one infected tree. Similar behavior was reported by Baldwin (1960) and Koplin (1969).

Initial increases in woodpecker populations result primarily from immigration. This immigration could result from purposeful aggregation by picids in the areas of heavy infestation, or it could merely represent prolonged stays by picids that normally drift through during postbreeding wandering and migration. Whether *Picoides* populations increased by aggregation or drift, they apparently did so in response to the increased winter food supply. Certainly, dead or dying "beetle" trees present a highly visible cue to woodpeckers of high concentrations of insect prey.

Koplin (1972) and Koplin and Baldwin (1970) reported 50- to 85-fold increases in woodpecker abundance in Spruce Bark Beetle outbreaks during winter, while breeding population responses have varied from no increase in limited outbreaks to a 6- or 7-fold increase in the 1939-1952 panepidemic (Koplin 1972). The limited rise in breeding densities is not surprising, because (1) woodpeckers are territorial and probably would not tolerate excessive crowding, and (2) bark beetles are apt to be a more significant food resource during the winter, when other prey species are less abundant or less accessible. Otvos (1965) suggested that Hairy Woodpeckers may be highly dependent on bark beetles during winter.

No increases of breeding densities in the Front Range have been reported during the present bark beetle epidemic, but it is only now reaching the extent of the 1939-1952 panepidemic, and continued surveys will be necessary to determine adequately the extent and duration of the apparent population expansion. Intensive logging activities designed to control the bark beetle presently are underway and may reverse this trend before it reaches its full potential.

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NATIVE BIRDS OF LANAI, HAWAII

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The island of Lanai is a pear-shaped shield volcano, covering 361 km^2, the sixth largest of the Hawaiian Islands. At its extremes, the island is 29 km long and 21 km wide, with the highest point at Lanaihale, 1027 m (Figure 1; Armstrong 1973). Mean annual rainfall varies from 25 cm along the coast to 89 cm near the summit (Armstrong 1973), although a substantial quantity of water, estimated to be as much as the annual rainfall, is directly intercepted from the cloud cover by the vegetation in the upper mountain areas (Ekern 1964).

I did a field study of bird species distribution and relative abundance on Lanai from August 1975 until November 1976. I conducted surveys and transect counts during this period to provide data for the United States Department of Agriculture Hawaiian Fruit Flies Laboratory to use in assessing possible effects of their Lanai fruit fly eradication program on nontarget animals. Most of the avian species now found on Lanai are introduced; however, some native birds are still present. Accounts on the native species follow.

ISLAND OF LANAI

A native forest may have once covered most of Lanai, but by the early 1900s cattle, sheep and feral goats had destroyed it (Perkins 1903, Rothschild 1893-1900, Wilson and Evans 1890-1899). Presently the native forest covers less than 7% of the island area (Armstrong 1973).

Today the principal forested area on Lanai is the mountain region, with a great deal of the vegetation consisting of introduced Molassas Grass *(Melinis minutiflora)*, guava *(Psidium* sp.*)*, eucalyptus *(Eucalyptus* sp.*)*, Christmas berry *(Schinus terebinthifolius)* and Norfolk Island Pine *(Araucaria heterophylla)*. The native ohia-lehua *(Metrosideros collina)* and false staghorn fern, or uluhe, *(Dicranopteris* sp.*)* are significantly found only above elevations of 610 m. Since the 1920s most of the central plateau has been in Pineapple *(Ananas comosus)* production, occupying about 20% of the island (Armstrong 1973). Lanai City, where most of the population of 2,200 reside, and Lanai Airport are strategically located on the plateau. About the only area on the plateau not under Pineapple cultivation is Kanepuu, which has remnants of a dry native forest that possibly once covered much of that section of Lanai. The coastal areas of the island are covered by introduced Koa Haole *(Leucaena leucocephala)* and Kiawe (a mesquite, *Prosopis pallida*) on the southern and western half and a wind-swept grassy range and coastal belt of Kiawe on the northern and eastern half. Rather extensive wind-eroded areas are found in many sections of Lanai, especially in the north end.

The coastline is divided into a Pali Coast on the south and west half from Kamaiki Point to Kaena Point and a Beach Coast along the north and east half. The Pali Coast is dominated by 22 km of sea cliffs, reaching heights greater than 305 m at Kaholo Pali (Armstrong 1973). Sea caves, arches and stacks are found along this coast. The Beach Coast, on the other hand, is low and flat, with broad expanses of alluvium and beaches and no appreciable sea cliffs. Polihua and Hulopoe have extensive white-sanded beaches; Manele-Hulopoe and Kaumalapau are the recreation and harbor centers of Lanai.

LANAI AVIAN HISTORY

Although the native forest of Lanai was much reduced by 1900, the birdlife was still considered abundant (Munro 1960, Perkins 1903), with a petrel, owl, thrush and six members of the endemic Hawaiian Honeycreeper family *(Drepanididae)* nesting on the mountain. However, by the 1930s the native avifauna had been virtually eliminated, and until recently only three species were considered present. A fourth, the Dark-rumped Petrel, was rediscovered on Lanai during this study.

Extinct birds include races of the Thrush *(Phaeornis obscurus lanaiensis)*, Creeper *(Loxops maculata montana)* and Akialoa *(Hemignathus obscurus lanaiensis)*, and populations of Ou *(Psittirostra psittacea)* and Iiwi *(Vestiaria coccinea)*. The Lanai Thrush was common in the mountain forest, especially at the north and south ends, until the 1920s. It declined in numbers after 1923 (Munro 1960), although it was still considered "not uncommon" as late as 1934 (Munro *in* Gregory 1935). The Lanai Creeper was common from about 460 m elevation to Lanaihale in the 1890s (Perkins 1903, Rothschild 1893-1900, Wilson and Evans 1890-1899), but scarce by the 1930s, with the last sighting of a pair in 1937 (Munro 1960). The Lanai Akialoa inhabited the upper mountain forest region and was rare even in the late 1800s, with the last definite sighting of an individual in 1894 (Perkins 1903, Rothschild 1893-1900). The Ou was quite common on Lanai in the 1890s but probably disappeared around 1932 (Munro 1960). Similarly, the Iiwi was considered abundant throughout the island forest in the 1890s (Perkins 1903), still fairly common up to 1923, but extirpated by 1929 (Munro 1960).

The causes of bird extinctions on Lanai are not definitely known, but are believed to include mosquito-borne avian diseases from birds, especially poultry, introduced with the establishment of the Pineapple plantation in the 1920s (Munro 1960), the destruction of the native mountain forest (Greenway 1967), and, to a limited extent, predation by feral cats *(Felis catus)* and pigs *(Sus scrofa)* (Munro 1960, Perkins 1903, Rothschild 1893-1900).

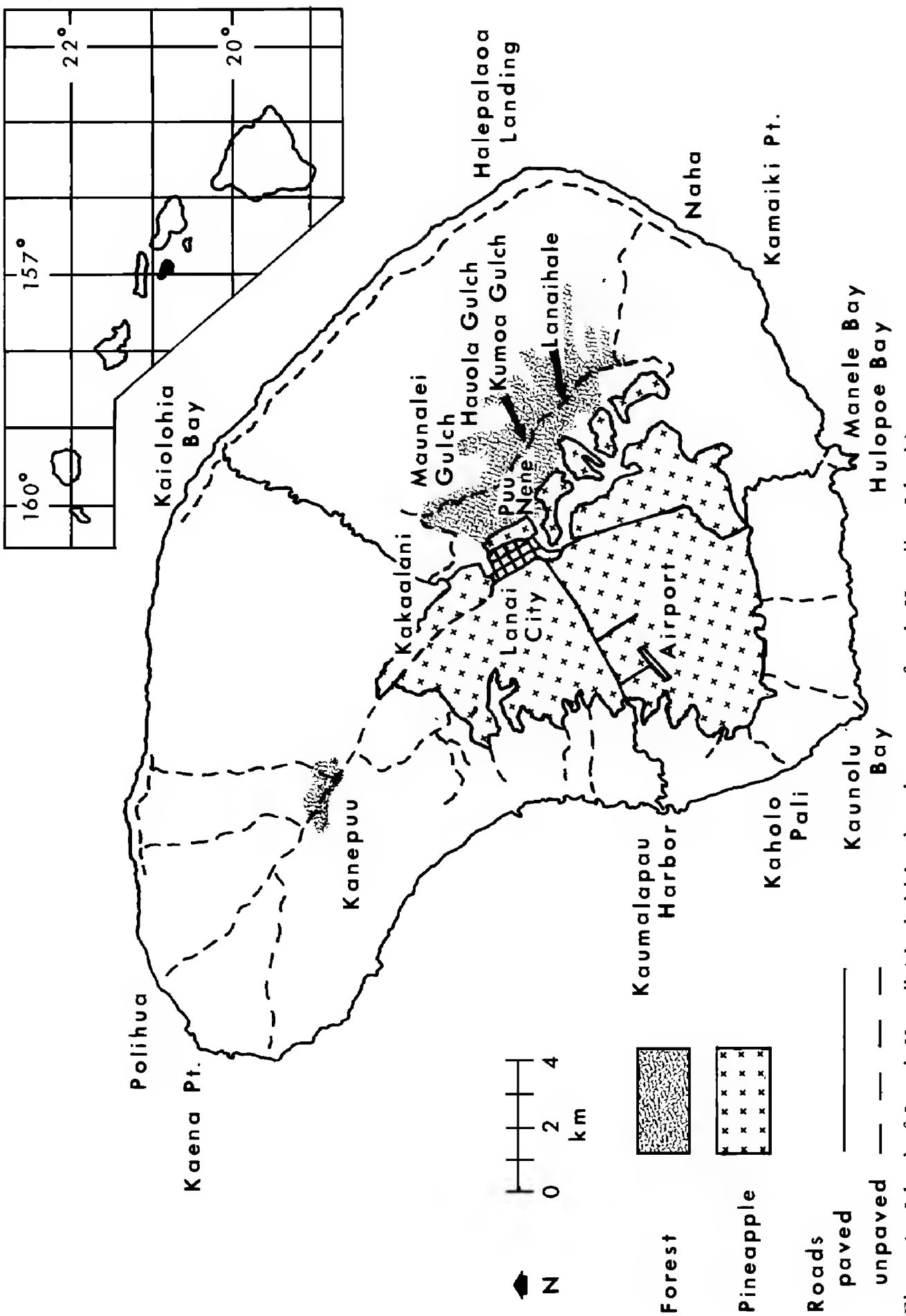

Figure 1. Island of Lanai, Hawaii (shaded island on inset map of main Hawaiian Islands).

EXTANT NATIVE SPECIES

WEDGE-TAILED SHEARWATER, *Puffinus pacificus chlororhynchus*. This race nests in Hawaii on the Northwestern Islands, offshore islands, Kauai and probably Niihau (Berger 1972). On Lanai a small colony, numbering from 5 to 10 birds, probably nests on Puupehe Island, a sea tower about 25 m high and 20 m in diameter, 45 m off of the point between Manele and Hulopoe Bays. In June and July 1976, at and after sunset, I observed light-phase Wedge-tailed Shearwaters flying low over the water toward the islet, circling the rock and landing on the grassy top. In August 1976 I saw a chick in a hole located near the top of Puupehe Island. By mid-September 1976 shearwater activity around the rock had ended. Other seabirds, notably the Bulwer's Petrel *(Bulweria bulwerii)*, may also nest on the island, but their presence there could not be verified because of the difficulty in reaching the islet. Other islets and stacks dot the Pali Coast and may also provide nesting grounds for this shearwater.

DARK-RUMPED PETREL, *Pterodroma phaeopygia sandwichensis*. This endangered Hawaiian race formerly nested on most of the main islands, but is now considered restricted to Maui and Hawaii (Berger 1972). The population on Lanai was believed extirpated by pigs and cats (Munro 1960), but night field work from June to October 1976 confirmed the presence of the Dark-rumped Petrel in the mountain forest (Hirai 1978). A possible colony, estimated from calls and sightings to be about 100 individuals, was located in June 1976 at an elevation of 850 m at Kumoa Gulch. Although I found no burrows, the petrels probably nest on the ridge slopes, which are covered by uluhe fern and ohia-leuha. From the available information, the breeding season of the Dark-rumped Petrel on Lanai seems to be similar to that of the population in Haleakala Crater, Maui, beginning in May and extending until November.

WHITE-TAILED TROPICBIRD, *Phaethon lepturus dorotheae*. This seabird is known to nest regularly in Hawaii only on Hawaii, Maui, Kauai and a few of the offshore islands (Berger 1972). On Lanai I noticed this tropicbird in all months of the year along the Pali Coast and in Maunalei and Hauola gulches. It probably also inhabits other gulches on the northeast side of the mountain. At one time I counted as many as 16 individuals in the gulches or against the sea cliffs. I found no nests during this study, but I observed adults landing on ledges or entering holes in cliffs along the coast and in the gulches in October 1975, from late February through early June 1976 and in August 1976. The remains of two young, feathered and lacking streamers, were found in Maunalei Gulch in August 1975. From these observations, the breeding season of the White-tailed Tropicbird on Lanai is prolonged and possibly year-round.

RED-TAILED TROPICBIRD, *Phaethon rubricauda rothschildi*. This tropicbird breeds on the Bonin and Hawaiian islands, most commonly in Hawaii on the Northwestern Islands (Berger 1972). On Lanai I found Red-tailed Tropicbirds along the Pali Coast, nesting in holes in the high sea cliffs from February through August 1976. Usually I saw only one or two individuals at one time but on 9 June 1976, near Kaholo Pali, I counted as many as 10 adults against the sea cliffs and over the ocean. I noted no Red-tailed Tropicbirds in the gulches on the island.

WHITE-CAPPED NODDY, *Anous tenuirostris*. This tern nests in Hawaii on the Northwestern Islands, offshore islands, and at least on the coasts of Maui and Hawaii (Berger 1972). On Lanai a colony of up to 30 light phase individuals probably nests and/or roosts year-round in sea caves or on the high cliffs at Kaneapua, a point of land adjacent to Kaunolu Bay. I also saw a few individuals in the Hulopoe-Manele area, and other colonies of White-capped Noddies may exist along the Pali Coast.

I noted other seabird species along the coast of Lanai. Solitary Brown Boobies *(Sula leucogaster)* and Great Frigatebirds *(Fregata minor)* were observed along the Pali Coast. Terns (probably Sooty, *Sterna fuscata*) and noddies (probably Common, *Anous stolidus*) were noticed out at sea flying low over the water in the direction of Oahu. The Black-crowned Night Heron *(Nycticorax nycticorax hoactli)* was occasionally seen on Lanai and the species is probably a regular, though infrequently noticed, visitor from nearby Maui.

AMERICAN GOLDEN PLOVER, *Pluvialis dominica fulva*. This Pacific race is the most common of the migratory shorebirds on Lanai, found from sea level to Lanaihale. Although a few birds remained on the island the whole year, most of the plovers departed for the nesting grounds in Siberia and arctic America by early May and started to return in mid-July. On the nine-hole city golf course I found plover numbers increasing from less than 5 birds in June to over 30 from October through April. In the mountain forest, I noted plovers on the unpaved road.

RUDDY TURNSTONE, *Arenaria interpres*. This shorebird appears to have a migratory cycle similar to that of the American Golden Plover. I observed flocks of up to 15 turnstones in tilled Pineapple fields and along the coastline, especially from Kaiolohia Bay to Halepalaoa Landing in every month of the year except June.

BRISTLE-THIGHED CURLEW, *Numenius tahitiensis*. This bird is a regular migrant from western Alaska to the Northwestern Hawaiian Islands and, in smaller numbers, to the main islands (Berger 1972). On 18 July 1976 I saw a Bristle-thighed Curlew on the sandy beach at Polihua.

WANDERING TATTLER, *Heteroscelus incanus*. I found this winter resident along the rocky shores, regularly at Puupehe Island, the Kaunolu

Bay area, from Kaiolohia to Halepalaoa Landing and at Naha. I saw a few solitary tattlers on Lanai throughout the year.

SANDERLING, *Calidris alba*. On Lanai this shorebird occurred commonly in flocks of up to five individuals along the sandy shores of the Beach Coast, especially from Kaiolohia Bay to Halepalaoa Landing, from mid-July through April.

SHORT-EARED OWL, *Asio flammeus sandwichensis*. This owl is distributed on all the main Hawaiian Islands in a wide range of habitats (Berger 1972). On Lanai I found Short-eared Owls in the grasslands on the northern and eastern sides of the island, Kanepuu, in or near the Pineapple fields, and over the mountain forest. The population size on the island could be termed common, with the species apparently in no immediate danger of being extirpated. Nesting information on this owl in Hawaii is scant, and it may breed throughout the year, depending on the food supply (Berger 1972, Munro 1960). In June and October 1976 I found young in the Kakaalani area, a Molassas Grass habitat.

AMAKIHI, *Loxops virens*. This species inhabits all of the main Hawaiian Islands, divided into four subspecies found on Kauai, Oahu, Maui-Molokai-Lanai, and Hawaii. It is believed to be the second most common of the surviving honeycreepers (Berger 1972). The Lanai population *(L. v. wilsoni)* was considered common before the 1920s, but then declined in numbers, possibly due to introduced bird diseases (Munro 1960). More recently it has been said to be rare (Berger 1972). During this study I briefly observed this bird in late February 1976 between Hauola and Maunalei gulches. For a few minutes I saw one Amakihi and heard a second in a Norfolk Island Pine. On no other occasion did I encounter Amakihi, raising the possibility that the population on Lanai may be close to extirpation.

APAPANE, *Himantione sanguinea*. A single species inhabits six of the main Hawaiian Islands and is believed to be the most common of the surviving species of honeycreepers (Berger 1972). This bird was considered rather abundant in the Lanai forest in the 1890s (Perkins 1903), but by the mid-1930s only a few remained (Munro 1960). I found Apapane mainly in the native mountain forest, although I noted occasional individuals in introduced vegetation at lower mountain elevations. Apapane were most common between Hauola and Maunalei gulches and at Puu Nene. During this study I found no nests, but I saw immature individuals in January and April 1976 in the Puu Nene and Maunalei-Hauola areas respectively. There have been speculations of interisland flights by Apapane (Berger 1972) and it may be that such movements have previously restocked the population on Lanai. However, today the Apapane population on the island seems stable and viable, although numbers are small and will probably never exceed the very low hundreds due to the quality and quantity of the native forest.

SUMMARY

Based on field work conducted from August 1975 until November 1976, species accounts of the native birds on Lanai are given. Five migratory shorebird species and eight native nesting species were found on Lanai. The migratory shorebirds were mainly distributed along the coastline in the nonsummer months, with American Golden Plovers and Ruddy Turnstones also noted in the Pineapple fields. White-tailed and Red-tailed tropicbirds, Wedge-tailed Shearwaters and White-capped Noddies were present and evidently breeding along the Pali Coast. White-tailed Tropicbirds were also observed in the gulches on the northeast side of the island. Short-eared Owls were common over much of Lanai, and a small but viable population of Apapane was found in the native mountain forest. Amakihi were seen only once in the mountain forest and the island population may be on the verge of extirpation. The Dark-rumped Petrel was rediscovered during this study, probably nesting in the mountain forest.

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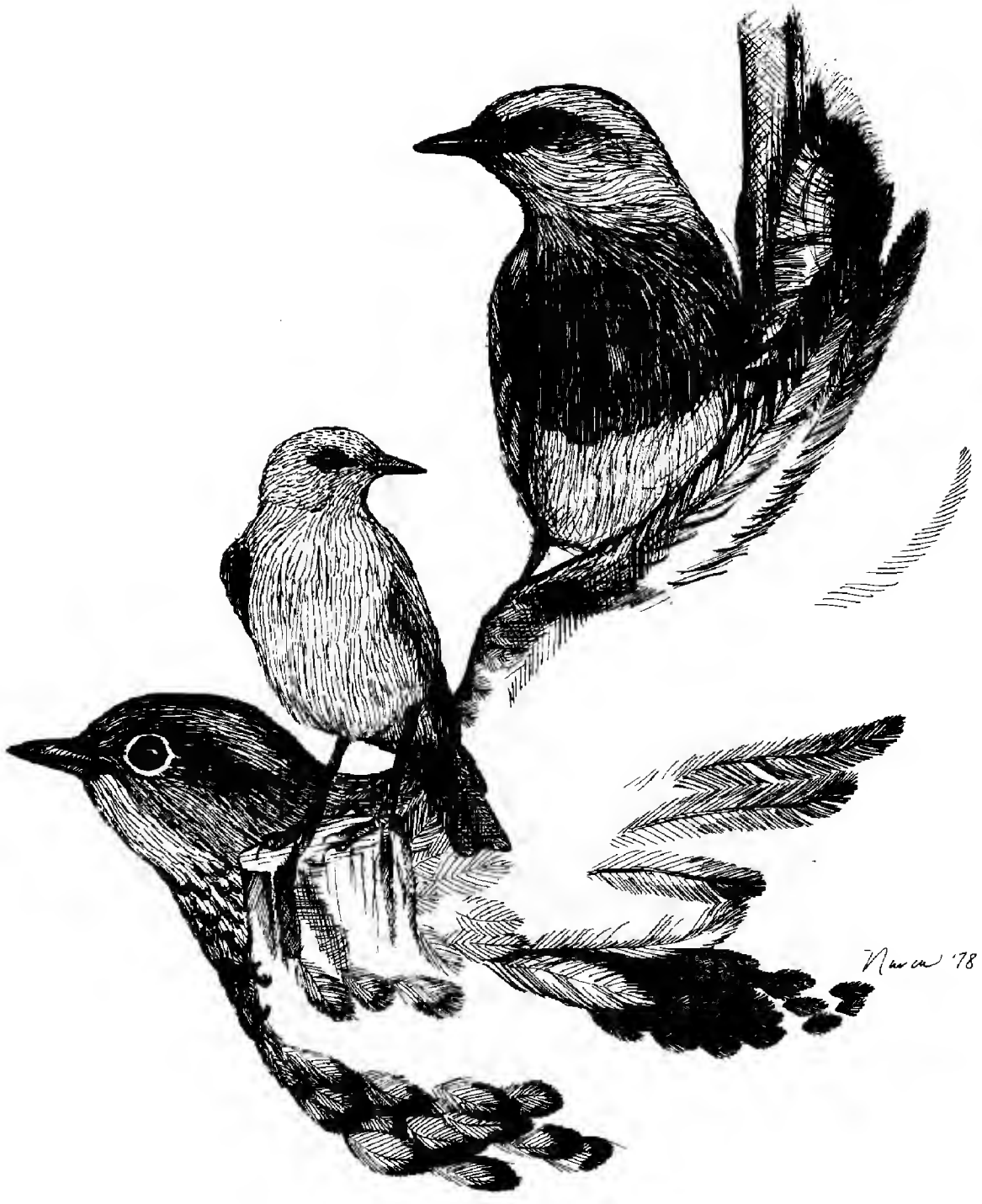

Sketch by Narca Moore

NOTES

WHITE-WINGED CROSSBILLS BREED IN NORTHERN UTAH

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On 28 June 1977 Stephen B. Vander Wall observed White-winged Crossbills *(Loxia leucoptera)* at an elevation of 2500 m on the crest of the Bear River Range, 13 km west of Laketown, northern Cache and Rich Cos., Utah. Having censused this area monthly since May 1976, I am certain the species was not present before the last week of June 1977. This occurrence in itself is surprising since only two small flocks had previously been reported in Utah (Worthen 1973, Behle and Perry 1975). Subsequently, I suspected breeding activities in early July and made weekly observations to verify breeding. Also, I captured, examined and banded 19 White-winged Crossbills at a small (<75 m^2) stock pond adjacent to a subalpine meadow on 28 July (7 captured), 6 August (8) and 16 August (4). The pond was the only source of surface water within several km^2 during 1977's extreme summer drought in the region. Many species, including Red Crossbills *(L. curvirostra)*, regularly visited the pond and were easily mist-netted. The nets were baited with salt to attract crossbills (see Samson 1976). Birds stopped visiting the pond in mid-August when it went dry. However, the addition of 200 l of water on 14 August was effective in reattracting many species including crossbills.

From the number of unbanded birds visiting the pond and from censuses in the area, I estimate the breeding population of White-winged Crossbills was roughly 30 to 50 individuals. All nine red plumaged males captured had large cloacal protuberances [$\bar{x}$ medial length (±S.E.)=7.4±1.1 mm, range=5.8–8.9 mm, measured with a vernier caliper]. Six of seven females had fully-developed brood patches. Each of the three females caught on 16 August had a very wrinkled apterium, a sign of active incubation (Kemper 1959). Two dull-plumaged first year males had smaller cloacal protuberances, 5.1 and 4.9 mm, respectively. Females (n=6) averaged heavier than males (n=9). The weight data for females were $\bar{x}$=26.9±2.5 g, range=24.0–30.0 g; for males, $\bar{x}$=26.7±2.4 g, range=23.5–31.5 g (measured with a 50 g Pesola scale). No sign of molt was found in any individual, suggesting all birds were in reproductive condition (Tordoff and Dawson 1965, but also see Kemper 1959).

On 13 September during a 2 h period several heavily streaked juvenile White-winged Crossbills were observed at the pond, begging food from adults and drinking water. No White-winged Crossbills were observed on 27 September and 8 October in 4 and 3 h of observation, respectively. Red Crossbills were still present on the latter dates, but in greatly reduced numbers. The area received heavy rain and some snow in mid-September and no birds were seen using the pond thereafter. However, small flocks (~10-40 birds) of White-winged Crossbills were again seen in the forest feeding on spruce cones on monthly censuses from December 1977 through May 1978. An adult and a first year male collected on 16 March 1978 both lacked a cloacal protuberance.

Casual observations made during many hours of pond watching and nest searching (in which no nests were found) show that the White-winged Crossbill has a breeding system like that of the Cassin's Finch *(Carpodacus cassinii)* recently outlined by Samson (1976). Specific similarities include: 1) all adult males are mated (paired); 2) all females are mated; 3) a population of unmated first year males exists; 4) adult males cease singing when paired while first year males continue to sing; 5) the male's "territory" revolves around the female; 6) first year males are probably physiologically capable of breeding (have cloacal protuberances). This type of breeding system seems adaptive for highly nomadic, irruptive species such as the White-winged Crossbill which depend on a suitable cone crop for breeding.

This report extends the known breeding range of this species more than 400 km farther south than the previous southernmost breeding locality in the Wallowa Mountains of northeastern Oregon (AOU 1957) and is the first confirmation of nesting in the United States Rocky Mountain area. White-winged Crossbills possibly breed in Idaho, but this has never been confirmed (Burleigh 1972), and there is circumstantial evidence of nesting in Montana (Skaar 1975). It is curious that this invasion into Utah occurred after a winter in which White-winged Crossbills were unreported in western North America (Smith 1977). However, the reason behind this invasion seems clear. The year 1977 was the best Engelmann Spruce *(Picea engelmannii)* cone year in 30 years, with some individual spruces having over 4000 cones (T. W. Daniel, Department of Forest Science, Utah State University, pers. comm.). Subalpine Fir *(Abies lasiocarpa)* cones were also abundant, but the White-winged Crossbills seemed to prefer the spruce cones. Another contributing factor may be the apparent cone failure throughout western Canada in 1976 and 1977 (S. Vander Wall, pers. comm.).

Tordoff and Dawson (1965) suggest that food, i.e., cones, could serve as both proximate and ultimate factors (sensu Immelmann 1973) controlling breeding in Red Crossbills. Ligon (1974b) experimentally proved that green cones of the Piñon Pine *(Pinus edulis)* are proximate factors for the breeding of Piñon Jays *(Gymnorhinus cyanocephalus)*, a corvid that is ecologically similar to the fringillent Red Crossbill (Ligon 1974a). Although this report does not prove that cones per se elicit the breeding response, the breeding of White-winged Crossbills in such numbers so far south of their usual range supports the hypothesis that food is the proximate factor regulating White-winged Crossbill breeding.

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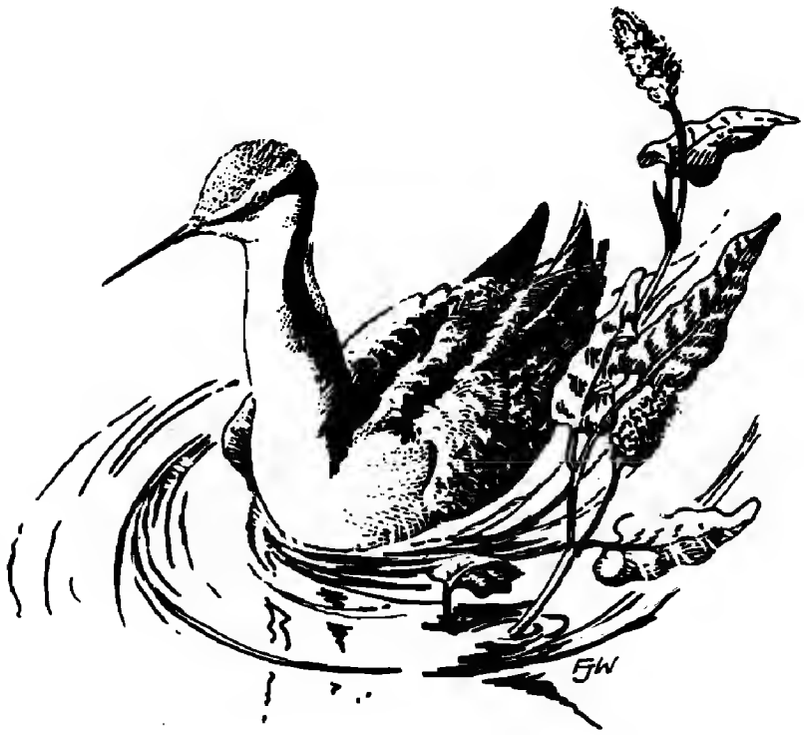

Sketch by F. J. Watson

NESTING OF SWAINSON'S HAWK IN SAN LUIS OBISPO COUNTY, CALIFORNIA IN 1977

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The Swainson's Hawk *(Buteo swainsoni)* was once a common raptor inhabiting eastern San Luis Obispo County (Louis Silveria pers. comm., Fred Truesdale field notes). It is now an uncommon breeding species throughout California and nesting in San Luis Obispo County is extremely rare. I attempted to locate Swainson's Hawk nesting territories during spring 1977 while conducting other research in the Coast Ranges of California.

A pair of Swainson's Hawks was reported to nest in 1976 on the San Juan Creek, San Luis Obispo County (Ron Walker pers. comm.). The nest was occupied in 1977 by Red-tailed Hawks *(Buteo jamaicensis)* (Lynette Shirley pers. comm.). I observed this nesting territory in 1977. It consisted of a large, isolated, dead cottonwood *(Populus* sp.) in the dry floodplain of San Juan Creek which runs through oak woodland, grassland and agricultural plant communities. The nest was placed on one of the few remaining large horizontal branches of the tree. It appeared that the nesting Red-tailed Hawks had added fresh sticks to the bulky stick nest.

I surveyed the length of San Juan Creek (53 km) by automobile and foot travel. Eleven similar territories were located. Nine sites contained large (approximately 20 m), isolated dead cottonwood trees with a buteo-type stick nest. One site had two large dead trees that were isolated from other trees in the area and both trees contained buteo-type nests. A final site contained a large, isolated dead cottonwood tree with only remnants of a stick nest. Live and non-isolated trees were also checked. No Swainson's Hawks were observed in those situations although Red-tailed Hawks and Great-horned Owls *(Bubo virginianus)* were common (11 and 4 pairs respectively).

Of the eleven territories observed, seven were occupied. Five were occupied by Red-tailed Hawks and two by Swainson's Hawks. The two Swainson's Hawk nests were 6 km apart. One tree occupied by Red-tailed Hawks also contained Barn Owls *(Tyto alba)* in the hollow trunk.

Four Red-tailed Hawk nests contained two young each and one contained one young. Each Swainson's Hawk nest contained one young, both of which were successfully fledged. The fledging success of the Red-tailed Hawk nests was not determined. No egg counts were conducted.

Because the Swainson's Hawk is: 1) occasionally mis-identified as the abundant Red-tailed Hawk, 2) not generally used by falconers for hunting, and 3) currently a widely spaced nesting species in California, it has received little of the attention or study awarded other species in recent years. These nesting attempts are among the few documented attempts for the central Coast Range region in the 1970s; clearly there has been a large scale population decline and range reduction for this species. Hopefully more researchers will document the occupancy and the productivity of Swainson's Hawk territories in other regions.

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A PROBABLE NESTING RECORD OF THE NORTHERN WATERTHRUSH IN OREGON

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On 4 June 1977 Sayre Greenfield, Alan Contreras and I observed a pair of Northern Waterthrushes *(Seirus noveboracensis)* on the south bank of Crescent Creek at Crescent Creek Campground, south of Davis Lake on the east side of the Cascade Range in Deschutes County, Oregon. Although there have been at least three previous sightings of the Northern Waterthrush in Oregon (Gabrielson and Jewett, Birds of Oregon, 1940:508-509; Kridler, Auk 82:496-497, 1965; E. G. Whiteswift pers. comm.), apparently this is the first time a pair of this species has been seen in the state.

Crescent Creek is a deep, swift-moving stream bordered by heavy grasses and lined with willows *(Salix* sp.) and a few stunted Red Alders *(Alnus rubra)*. These small, bushy trees form dense thickets extending 50-200 m from the edges of the creek back to the beginnings of the dominant forest, a mixture of Ponderosa Pines *(Pinus ponderosa)* and Lodgepole Pines *(P. contortus)*. The deciduous thickets are quite moist and are laced with small pools and wet areas.

The birds we observed appeared at about 1000, in response to imitations of the call of the Pygmy Owl *(Glaucidium gnoma)*, and were seen from a distance of about 10 m directly across the creek under perfect, sunny observing conditions, through 7x and 8x binoculars. They both emerged from the dense undergrowth and perched together, tails bobbing and bodies held in a horizontal plane, for over a minute in a dead willow on the creek's edge. Field marks noted by all observers included: pale colored tarsi, thin bill, dark crown, dark eye line, creamy-yellowish superciliary line, dark back and rectrices, and underparts with a distinctly yellowish wash and dark brown spotty streaking. The streaking reached up onto the throats of both birds and grew finer in this region. However, on one bird the streaks ended on the breast and sides, while on the other they extended, more typically, well down onto the belly. Such highly visible dimorphism is not mentioned in the literature, and its significance in these birds is unclear. The strong yellowish hue on the undersides renders somewhat unlikely the subspecies classification of *S. n. notabilis*, the common western race, and possibly places these birds into either the eastern subspecies, *S. n. noveboracensis*, or the British Columbia race, *S. n. limnaeus*. The describers of the latter subspecies (McCabe and Miller, Condor 35:196, 1933) write that it is less yellow than the eastern variety and more yellow than the western. Sayre Greenfield, who is familiar with *S. n. noveboracensis* in the Ithaca, New York area, noted at the time that the Crescent Creek birds appeared fully as yellowish underneath as any he had seen in the eastern United States.

Perhaps most significantly, both waterthrushes remained in precisely the same location for at least the next month. During June the pair was seen repeatedly and photographed (Larry McQueen, Harry Nehls et al.) and one, presumably the male, was heard singing on all occasions. On 21 June I returned to the site and observed the singing male and, more briefly, the second bird low on the banks of the creek, not more than 5 m from the location of the initial sighting. The second bird disappeared almost immediately and made no sound, while the male continued its loud, crisp song from various spots as I followed it through the undergrowth. Its singing was quite persistent. A careful search of the more accessible portions of the area failed to reveal a nest, but the waterthrush is a species noted for clever concealment of its nest. The willow thickets back from the creek are next to impenetrable and contain many small pools, any one of whose margins may well have contained a waterthrush nest.

The birds were last seen on 24 June by Harry Nehls and David Fix. Though they were not seen thereafter, they were heard several times in July (Harry Nehls pers. comm.). Their date of departure remains unknown. They were not present when I searched the area on 10 August. Their absence on this date is not unexpected, for they are known to begin southward migration before the end of July and to reach the South American wintering grounds as early as mid-August (Bent, U. S. Natl. Mus. Bull. 203:484, 1940).

In summary, it is highly probable that these two Northern Waterthrushes at least attempted to nest along Crescent Creek, considering that they were, in all likelihood, a male and a female (obvious behavioral differences and possible sexual dimorphism), that they remained in close proximity both to each other and to the site of first observation for at least a month, and that timing and habitat were ideally conducive to waterthrush reproduction. These observations and the sighting of lone, singing male on 18 June 1977 by Larry McQueen (pers. comm.) on the Little Deschutes River, not far from Crescent Creek, suggest the possibility of the establishment of this species as a rare breeding bird in suitable habitat along the eastern flanks of the Oregon Cascade Range. They should be watched for in the future in this region, and all sighting should be carefully studied for subspecies identification.

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BLACK-THROATED SPARROW VAGRANTS IN THE PACIFIC NORTHWEST

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Nancy Hunn and I observed a single adult Black-throated Sparrow *(Amphispiza bilineata)* 16 May 1976 at the Pt. Grenville Coast Guard Station, Grays Harbor Co., Washington. The bird was feeding actively on the lawn of the Coast Guard facility with a flock of about five Savannah Sparrows *(Passerculus sandwichensis)*, three American Goldfinches *(Carduelis tristis)* and one White-crowned Sparrow *(Zonotrichia leucophrys)*. The Coast Guard Station perches on a high promontory facing the Pacific Ocean and surrounded by second growth coniferous forest typical of the coastal Sitka Spruce *(Picea sitchensis)* zone (Franklin and Dyrness 1973: 58-63). Color photographs obtained with the aid of K. C. Johnstone of the U. S. Coast Guard are not of publishable quality but do allow the bird to be identified. Copies of these color slides have been deposited with the Washington Bird Record File at the University of Washington Museum. A sketch drawn while the bird was under observation is also in that file. The following details were recorded at the time of the observation:

> The bird was plump, sparrow-shaped with a dark grey conical bill. Its body was scarcely if at all larger than the Am. Goldfinch and noticeably smaller than the Savannah and White-crowned sparrows. However its tail was considerably longer than that of either goldfinch or Savannah Sparrow, being nearly as long as its body. The bird looked more or less like a cross between a junco and a chickadee. The crown was medium grey edged with slate back as far as the eye. There was a broad white superciliary. The lores were black merging into a dark grey face patch broken only by the white lower eyelid. The face patch and crown merged into a grey nape on the side of the head behind the eye. The chin, throat and breast were marked with a black diamond-shaped bib outlined by the white malar stripe and breast. The malar stripe ended about 1 mm short of the bill which was edged all around with black. The sides [of the breast] were pale grey which merged rather abruptly into the white outlining the black bib. The center of the belly to the under tail coverts was whitish. The rear flanks were pale buffy white. The back and wings were clear medium brown without streaking or wing bars. The tail was dark brown, long and square. A white edge on the outer tail feather could be seen when the bird spread its tail (which was not often, hence the white on the tail was difficult to discern). The legs were dark. I heard no vocalizations.

Subsequent attempts to find the bird on 18 and 20 May were unsuccessful. A cold front moved onshore the night before the observation. This may have grounded a group of north-bound migrants. Fair weather following may have allowed this bird to move on.

The Pt. Grenville Black-throated Sparrow record just detailed is the first photographically documented report for the state of Washington. Mattocks, Hunn and Wahl (1976:21) list the species as hypothetical, citing a sight record by W. L. Dawson of two birds near Brooks Lake, Douglas Co., 31 May 1908. A third apparently valid sighting is of a bird on the lawn of the Ohanapecosh Ranger Station, Mount Rainier National Park, 23-24 May 1959. It was observed at close range by rangers Sellers and D. May (USDI 1964; fide W. Harrington-Tweit). Since the Pt. Grenville sighting, a single bird was noted 10 May 1977 south of Walla Walla about 2 km north of the Oregon State line (K. Knittle pers. comm.). These and extralimital records from western Montana, Idaho, British Columbia, Oregon and

northern California are summarized in Table 1 and are shown in Figure 1 as open circles. Known breeding sites in Wyoming, Utah, Nevada, southern Idaho, southeastern Oregon and northeastern California are shown as black circles. Records which may indicate breeding, at least on a casual basis, are shown as half-dark, half-open circles and the potential breeding range is outlined with dashes.

A single report of a bird beyond its normal range is of little note unless it can be shown to reflect a more general pattern, in which case it is no longer an "accidental" occurrence. Thirty-one of 35 (89%) individual vagrant Black-throated Sparrows in this region appeared between 6 May and 10 June and 22 (63%) of

Figure 1. Black-throated Sparrow distribution in the Pacific Northwest. Open circles show locations of vagrants. Black circles show breeding sites. Circles half-black, half-open show locations of possible breeding birds on the periphery of the species' known breeding range. The known breeding range is outlined by the solid black line; the potential breeding range by the dashed line.

Table 1. Potential breeding and vagrant Black-throated Sparrow records for the Pacific Northwest. *Audubon Field Notes* and *American Birds* are abbreviated AFN and AB.

		SOURCE
BRITISH COLUMBIA		
8 June 1959	Murtle Lake, Wells Gray Provincial Park (1, specimen)	Godfrey 1966:389
MONTANA		
10 June 1968	Missoula, Missoula Co. (1)	AFN 22:632
21 May 1975	Near Missoula (1, photographed)	AB 29:885
IDAHO		
Potential breeding	Near Ellis, Pahsimeroi Valley	Burleigh 1972:411
Potential breeding	Cassia Co.	Burleigh 1972:411
6 May 1953	Rathdrum, Kootenai Co. (1, specimen)	Burleigh 1972:411
WASHINGTON		
31 May 1908	Near Brooks Lake, Douglas Co. (2)	Mattocks, Hunn and Wahl 1976:21
23-24 May 1959	Ohanapecosh Ranger Station, Mt. Rainier National Park (1)	USDI 1964
16 May 1976	Pt. Grenville, Grays Harbor Co. (1, photo)	AB 30:882
10 May 1977	Near Walla Walla, Walla Walla Co. (1)	AB 31:1027
OREGON*		
Potential breeding	Wright's Point, Harney Co.	Gabrielson and Jewett 1970:565; Dubois 1959:435; AB 31:1165
Potential breeding	Silver Lake, Harney Co.	Gabrielson and Jewett 1970:565
Potential breeding	Lake Abert, Lake Co.	T. Manolis pers. comm.
Potential breeding	Nilakshi Ridge, Klamath Co.	Brown 1960:220-221
16 May 1959	Beaverton, Washington Co. (1)	Dubois 1959:435
17-19 May 1959	Baker, Baker Co. (1)	AFN 13:390
28 May 1959	Milwaukie, Clackamas Co. (2)	Dubois 1959:435
Shortly before 4 June 1959	Depoe Bay, Lincoln Co. (1)	Dubois 1959:435
ca. 4 June 1966	Brothers, Deschutes Co. (1)	AFN 20:588
23 May 1970	Lebanon, Linn Co. (1, specimen)	AFN 24:638
23 May 1970	On coast, Curry Co. (1)	AFN 24:638
30 May-2 July 1970	Roxy Ann Butte, Jackson Co. (3+, 2 banded)	AFN 24:638, 711
18 May 1975	Portland, Multnomah Co. (1)	AB 29:901

Table 1 (cont)

		SOURCE
31 May 1975	Roxy Ann Butte (1)	AB 29:901
26 April 1977	Near Florence, Lane Co. (1, photo)	AB 31:1040
CALIFORNIA** (spring records west of the Sierra Nevada)		
Potential breeding	Near Honey Lake, Lassen Co.	AB 29:21
6 June 1959	Near Patterson Pass, Santa Clara Co. (2)	McCaskie and DeBenedictis 1966:28
12 May 1972	Near Arcata, Humboldt Co. (1)	AB 26:807
14-20 May 1972	Pacific Grove, Monterey Co. (1, photo)	J. Winter pers. comm.
17 April 1974	Farallon Is., San Francisco Co.(1)	AB 28:850
12 May-6 June 1974	Near Chico, Butte Co. (4)	AB 28:850
16 May 1975	Near Chico (1)	AB 29:906
12-31 May 1977	Farallon Is. (2)	AB 31:1045

* A report of 12 seen 10 April 1975 near Finley National Wildlife Refuge, Benton Co., Oregon (AB 29:901), seems unlikely and is without supporting details. A report of potential breeding near Hampton, Deschutes Co. (AB 27:896), was based on song only and has not been verified (H. Nehls pers. comm.).

** Most northern California reports were summarized by Jon Winter (pers. comm.) from the *American Birds* regional editors' files. In addition to those listed there are eight fall reports, including six from the Farallon Islands, and two winter reports. Of nine reports from the Sierra Nevada, one is for fall, one for winter and the remainder between 3 May and 28 June.

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these individuals were noted during the latter half of May. These contrast with typical mid-April arrivals at northern California breeding sites (McCaskie and DeBenedictis 1966:28). Most of these vagrant birds quickly move on. Almost all reports involve single birds or pairs, and most are far from suitable habitat. In short, these individuals appear to have overshot the mark during spring migration and to have been wandering for some time.

There may also be a greater tendency for vagrancy of this type in certain years. Three or more reports have been noted in four years (1959, 1970, 1975 and 1977) with a total of seven sightings from four states in the spring of 1959, the year of the Canadian record. The spring of 1959 was characterized by severe drought from the southwest (Monson 1959, Small 1959) to the northwestern extremity of the Black-throated Sparrow's breeding range at Malheur National Wildlife Refuge in Oregon (Scott 1959). The widespread drought conditions of the winter of 1976 brought three sightings from as many states. The two northern California coastal sightings in 1972 coincided with a drought restricted to the southwest. However 1970, which saw three reports, was characterized as cool, and 1975, with four reports, was an extremely cold and wet spring throughout the western United States.

In conclusion, drought conditions in the Black-throated Sparrow's breeding range may increase the probability of the vagrancy pattern described here. However other factors may also increase that probability.

I would particularly like to thank William Harrington-Tweit, Tim Manolis, Philip Mattocks, Jr., Harry Nehls, Richard Stallcup and Jon Winter for generous assistance in the preparation of this report.

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A DEFINITE RECORD OF THE TRUMPETER SWAN FROM NEW MEXICO

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An adult Trumpeter Swan *(Olor buccinator)* was illegally shot and killed on Bear Canyon Reservoir in the Mimbres River Valley east of Silver City, New Mexico, on or about 23 February 1977. One of my students, Wyatt Pickering, salvaged the bird from the reservoir and although it had been partially eaten by fish or turtles, I prepared it as a study skin (DAZ 2660) which presently is housed at Western New Mexico University.

The bird's measurements (wing 648 mm, total length 1350 mm), large relative bill size, bill shape and reddish mandible edge initially suggested *buccinator*, but its weight (ca. 8618 gr, plus at least 450 gr removed by scavengers) and 22 rectrices (compared to 24 in the Trumpeter, and 20 in the Whistling Swan, *O. columbianus*) made determination on external criteria less than certain. However, longitudinal section of the sternum revealed the distinctive vertical loop in the trachea in its special bone housing—the definitive identifying character of a Trumpeter Swan. After being photographed, this section and other parts of the body skeleton were preserved. The bird's gonads were destroyed by shot, precluding sex determination.

Local fishermen reported seeing the swan, prior to its demise, for "at least a month" as it flew in, alone, from an unknown feeding ground to roost on the reservoir each evening. So far as is known, it was not seen alive by any bird student.

This is the first substantiated record of the species in New Mexico, and there is no Arizonan or west Texan record of which I am aware. Indeed, so far as I can determine, this constitutes the southernmost record for the species, at least in recent years. D. E. Merrill's report (Auk 1932:460) of a Trumpeter Swan shot along the Rio Grande near Las Cruces, N.M., in November 1931 has not been and cannot be accepted. (However, it was included without comment in J. S. Ligon's *New Mexico Birds and Where to Find Them*, Univ. of N.M. Press, Albuquerque, 1961.) Although allegedly "Mr. A. E. Archer made a skin of the specimen," there is no evidence that material was in fact preserved or properly identified.

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A VIOLET-CROWNED HUMMINGBIRD IN CALIFORNIA

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Sometime during the morning of 6 July 1976 William Haggard of Santa Paula, Ventura County, California noted a strange hummingbird at one of his feeders, located in an oak-chapparal canyon. He identified the bird as a Violet-crowned Hummingbird *(Amazilia verticalis)*. On 17 July we visited the feeders and observed the hummingbird several times at very close range. The following description was obtained:

> Crown, and sides of head above eye, dull violet. Upper back greenish, slowly becoming brownish on lower back. Upper surface of tail dark brown, contrasting with lighter brown of lower back. Bill red. Underparts and sides of neck, white. Indistinct dusky speckling on sides.

We took color photographs which are on file with the authors. The bird was subsequently seen by many observers and remained at the Haggard residence until late December 1976. It was also seen for a few days in early July 1977. During the early part of its stay the bird visited the feeder area once every 45 minutes or so, but later the visits became less frequent with one 2 week period in the late fall when it was not seen at all.

This observation constitutes the first record of the Violet-crowned Hummingbird in California, and the first anywhere outside of Arizona, New Mexico and the Republic of Mexico. The normal range of the species extends from northeastern Sonora, extreme southeastern Arizona, extreme southwestern New Mexico and western Chihuahua south to Puebla, Guerrero and Chiapas. The species occurs in the northern part of its range only during the breeding season and winters from southern Sonora southward (AOU 1957).

The range of this hummingbird has apparently been spreading slowly northward during the past 70 years. The first specimen for the United States was collected on 4 July 1905 in the Huachuca Mountains of Arizona and subsequent collections were made in the Chiricahua Mountains in 1925 and at Patagonia, Arizona in 1948 (Levy 1958). In the early 1960s the Violet-crowned Hummingbird began to show up almost every summer at feeders in Ramsey Canyon, Arizona (Sheppard 1968). In the summer of 1959 the first breeding record for the United States was established with the finding of several nests in Guadalupe Canyon in extreme southwestern New Mexico and extreme southeastern Arizona (Zimmerman and Levy 1960). Until the fall of 1970, however, no Violet-crowned Hummingbird had appeared in any area in the United States outside the mountains of southern Arizona and New Mexico. But in late 1970 an individual appeared at a feeder in Tucson, Arizona and remained until late February 1971 (Snider 1971). This was the first winter record for the United States. Another was seen in the vicinity of Tucson in October 1972 (Monson 1973). The trend to more northerly and westerly observations is continuing as is seen in the appearance of an individual in Prescott, Arizona, between 11 and 19 October 1975 (J. Witzeman pers. comm.).

While the taxonomy of this species has a long and confusing history well beyond the scope of this note, it is generally believed there are three races: *A. v. violiceps, A. v. viridifrons* and *A. v. ellioti* (Wetmore 1947, Phillips 1965). The first two races mentioned occur from Puebla, Morelos and Oaxaca southward, while *ellioti* is the northern race and thus the one most likely to occur in California.

Examination of 129 skins at the Moore Laboratory of Ornithology at Occidental College revealed that the Santa Paula bird did not show the typical plumage

of the northerly race of the Violet-crowned Hummingbird. The bird in Santa Paula had a brown tail; only 8% of the specimens examined showed brown tails. The two southerly races have substantial iridescent bronze coloring in the tail. Furthermore the tail was darker than the back. Sixteen percent of specimens showed tails (either greenish or brown) darker than the back. There was no seasonal variation in the color of the tail. It is logical to assume that the bird in Santa Paula was a representative of *ellioti*. In the first place, a few *ellioti* do have brown tails. Secondly, and more important, the California bird had none of the bronze tinge so noticeable in the tails of southern subspecies.

It was impossible to determine the sex of the bird seen in Santa Paula. Some authors stress the blue-violet crown of the male as opposed to dull greenish-blue in females and immatures. Inspection of skins revealed very substantial overlap in the colors and brightness of the crown between the sexes, thus casting doubt on the validity of this field mark.

We have conducted an extensive investigation into the possibility that the bird was an escapee from captivity, having discussed the matter with several local authorities on hummingbirds, including Luis Baptista of the Moore Laboratory, Donald Bleitz of the Bleitz Wildlife Foundation and the curators of birds at the Los Angeles and San Diego zoos. All believe the California bird was not an escapee. We were able to find only one instance of Violet-crowns kept in captivity. About 8 or 9 years ago, Bleitz owned two birds which he eventually sent to the San Diego Zoo. Zoo records show these birds died in May 1970 (A. Risser pers. comm.). We also made inquiries of the Santa Barbara Zoo and several retail pet dealers in the Ventura and Los Angeles areas. None of these sources knew of any hummingbirds of any kind recently kept in captivity in southern California. We also found that a roof blew off an aviary in Hawthorne, Los Angeles County, 8 or 9 years ago. Sixty birds escaped; none were Violet-crowns (D. Bleitz pers. comm.). Detailed records of this investigation are on file with the authors and with the California Bird Records Committee. Based on all the information at hand, we believe that the chances that this was an escaped bird are minimal.

We would like to express our gratitude to Mr. and Mrs. William Haggard for reporting the presence of the bird and for their kindness in permitting many people to come onto their property to view it. Thanks are also due Luis Baptista for allowing us to examine the excellent series of skins at the Moore Laboratory and to Donald Bleitz for his assistance on the "escapee" question.

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